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Insulation

THERE are few aspects of electrical science to which so much attention has been devoted in recent years as to insulation. On it depends the ability to transmit large blocks of power over any distance, short or long. Yet it is so rarely possible to know in advance what is likely to happen outside well-defined working limits that there is some justification for asking whether the technique of insulation is a science or an art.

For example, soon after 33-kV cables were introduced it was found that methods of manufacture suitable for 22-kV would not do for the new electrical conditions created, and the discussions as to whether it was more desirable to get rid of heat or of tangential electrical stress indicated that the kind of faults that so often occurred were totally unexpected. Are engineers clear even now as to the physical nature of ionisation?

The enormous cost of maintaining insulation, whether for overhead or underground constructions, provided the engineering touch to Professor W. M. Thornton's presidential address to the Institution of Electrical Engineers—an address which, for its originality of outlook and thought-stimulating character, will be given a place well in the front rank of such discourses. It was not so much a survey of present tendencies as a crop of suggestions—the by-products of a fertile mind worked out in the rough—for new lines of research, any one of which would be more than a whole-time job for one man to carry through to its conclusion.

One of the most important lines of investigation is that presented by surface films of moisture, often invisible. Instances within our own knowledge lend support to Dr. Thornton's view that arc-overs in switch cubicles are due, in some cases at any rate, to moisture films rather than to ionisation in a confined air space. Presumably the reason that the risk is reduced by keeping the air in motion is mainly that the moisture is thereby evaporated.

The validity of a number of widely held views comes into question; thus, it would appear that ignition of gas by a spark is due not to the heat generated, but to the ionisation that occurs during the passage of the spark. Again, we have always found it difficult to accept the theory that the conductivity of water explains the marked effect of its presence in minute quantities in oil. That the breakdown of the insulating properties is caused by the increased electric gradient in the oil due to the high dielectric constant of water seems a much more reasonable supposition.

The stimulus to electrical progress which would follow the enunciation of a basic theory that could be applied with confidence to forecast the results of any new departure in practice can hardly be exaggerated. The present methods require the confirmation of time that we can ill afford. It seems likely that the formulation of such a theory must wait until the engineer, working upwards from time-stress empiricism, meets upon common ground the physicist working downwards from wave mechanics.

What is a Small House?

DURING a recent conference it was decided that, as a general guide for electricity supply men, "a small house" should be regarded as one with five rooms or under, with a rateable value of £15 or under, and the total annual income of the household of which was £250 or under. The meeting took place at E.D.A. headquarters by invitation of one of the committees, and Captain Donaldson, who was in the chair, referred to the need for pooling experience regarding what was happening in this field and for discussing new ideas for the cheapening and simplification of wiring, service, tariffs, and arrangements for the supply of apparatus. The meeting recommended the Council of E.D.A. to set up a committee on electricity supply to small dwellings. The personnel was named, and terms of reference were adopted under which existing and new housing schemes

will be reported upon from the electrical standpoint so as to secure the fullest possible electrical development, while suitable propaganda efforts will also be recommended. The need for strenuous efforts to be made by electrical interests to counter keen gas competition during the approaching period of increased building activity was not lost sight of.

"The House is Not My Own!"

IT is unlikely that this committee will limit its attention to new property. The problem of the existing small dwelling, like the poor, has always been with us, but we have far too long neglected old property, below a certain size, in our obsession with the new. It has been urged repeatedly here that in most areas far greater attention should be devoted to the premises where gas has long been entrenched. No engineer, or shall we say no undertaking, is proceeding along right lines if only the easier business of new property is being sought after, while the problem of the existing houses where the old relations of landlord and tenant still obtain stands neglected or deferred. The millions of unwired houses about which we so often talk consist very largely of dwellings coming within this category. Though, of course, the subject is not new, we commend readers' attention to Mr. R. D. Reynolds's article on "Wiring of Tenanted Property" appearing on page 613 of this issue. However many millions of pounds may be expended upon new property during the next few years, we must remember that our estimates for great electrical advance during that period are based upon the figures for houses already existing but unwired.

Electricity Saves Time

THOSE of us who have used electricity to a considerable extent in our houses know that it certainly does save time, but, so far as we are aware, no collected data is available. The Electrical Association for Women is putting itself into a position to answer definite questions on the subject by the issue of a questionnaire to users of domestic appliances, especially in rural districts. The inquiry compares the time spent weekly when using coal and oil to that taken now with the modern method. There can surely be no question that the filling and cleaning of oil lamps and stoves and attending to coal fires wastes a considerable amount of time and effort. Quite possibly it takes longer to work a vacuum sweeper than to flick the dirt from one spot to another with a duster, but it does do the work. Even were there no economy in time, the avoidance of drudgery would justify electrification.

A Fair Field?

THE merits of electricity for street lighting should be enough, especially in view of recent lamp developments, to secure its adoption where no favour is shown to any particular method of illumination. Yet the inhabitants of Halifax (where both electricity and gas undertakings are owned by the Corporation) have not only to put up with almost all-gas public lighting, but are to see the system extended. The Watch Committee's report was severely criticised, and, according to a local newspaper, it was suggested by some councillors that it was not without bias. However public-minded its members may be, a Watch Committee containing a preponderance of Gas Committee men, six of whom (out of eight) have been appointed to the Lighting Sub-committee, can hardly be regarded as an impartial body.

E.D.A. Talking Films

AN advance view of the three talking films prepared under E.D.A.'s propaganda scheme will be given at Prince Edward Theatre, Old Compton Street, London, W, on Wednesday, November 21st. At 8.30 p.m. Jack Payne and his band will open with a twenty minutes' reel, and "The Wizard in the Wall," "Well, I Never!," and "Plenty of Time for Play" will then be run off in time for an "E.D.A. reunion" at 10.30 p.m. Electricity supply chairmen and engineers will, no doubt, be in attendance in large numbers, but it is desirable that signing the contract letter mentioned in our issue of October 5th, p. 440, shall not be deferred until after the demonstration. This should be done immediately, in order to ensure that the campaign may be in active progress in many areas early in December.

Electrical Irrigation in India

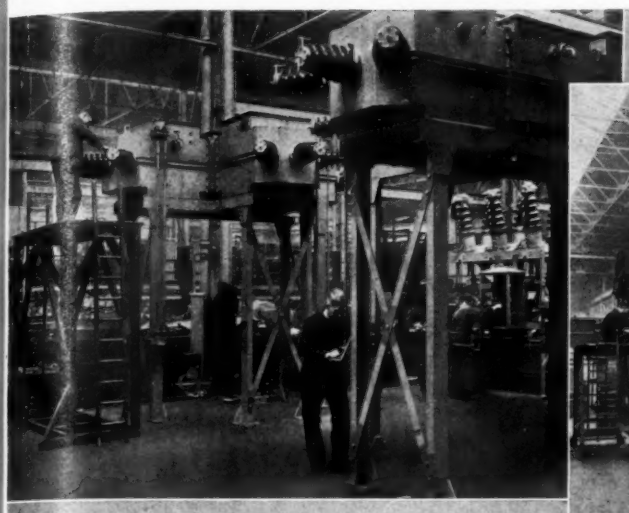
BEING essentially agricultural in nature, the United Provinces in India are already making full use of all the available river water, which is distributed by a system of gravity canals. Tube-well pumping has thus become the only practicable means of extending irrigation. Accordingly, having determined experimentally the economic feasibility of pumping water from the subsoil, the State has embarked upon a programme of development with which electrical manufacturers would be well advised to acquaint themselves. As is shown elsewhere in this issue, the project is one of considerable magnitude, namely, utilising the hydro-electric grid distribution system for the furtherance of cheap pumping and crop processing. More generating stations will be needed, and several hundred tube-well electric pumping installations are to be ordered annually over a period of from five to seven years. An opportunity is thus offered to British contractors to show Mr. W. L. Stampe, chief engineer, irrigation branch, United Provinces, what can be done to reduce the cost of equipment by improved design and mass production.

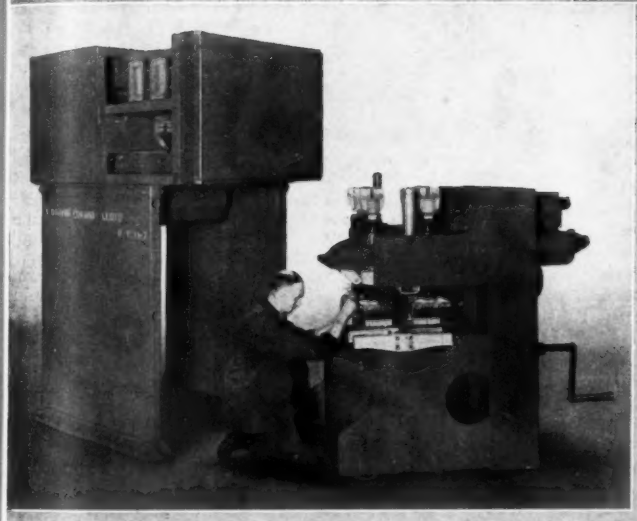
"This Freedom"

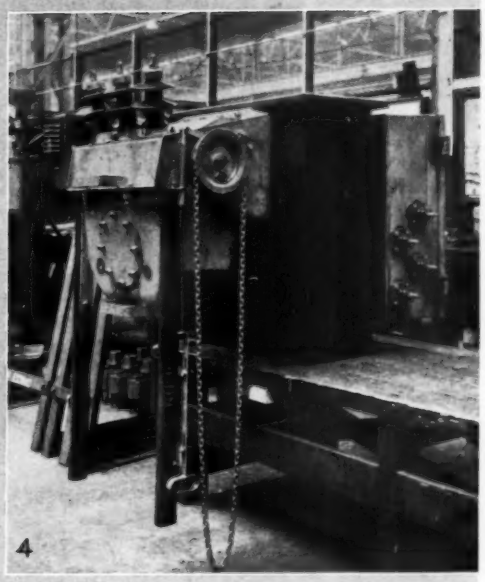
WHAT is necessary to give us back the freedom our fathers won for us? The Liberty Restoration League has a simple formula: to oppose the Electricity (Supply) Bill now before Parliament which, it believes, is a Machiavellian attempt to make supply undertakings subsidise the railways! Then follows an attack on railway electrification, in terms that appear to indicate ignorance of the thousands of miles of line that have been successfully electrified in other countries for many years. All this is because the Central Board seeks powers to supply the railways direct, instead of compelling the latter to negotiate with each undertaking through whose territory the track happens to pass. If the railway companies were tied down to purchase such fuel for their steam locomotives as might be available in each local authority's area served, how quickly would the exasperated managers see the merits of electrification if only they could purchase energy from a single body! As things are the boot is on the other foot.

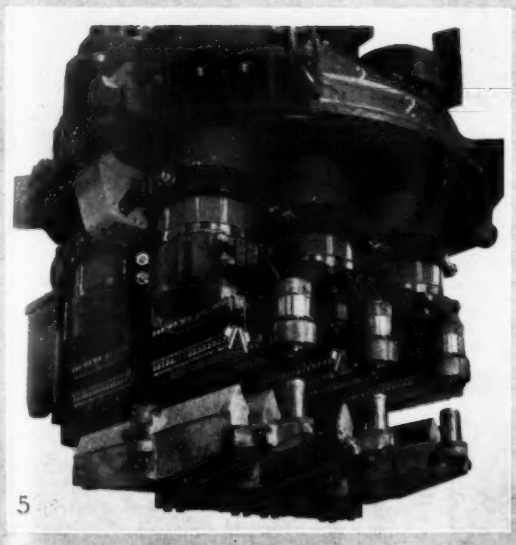
The Electricity Supply Bill

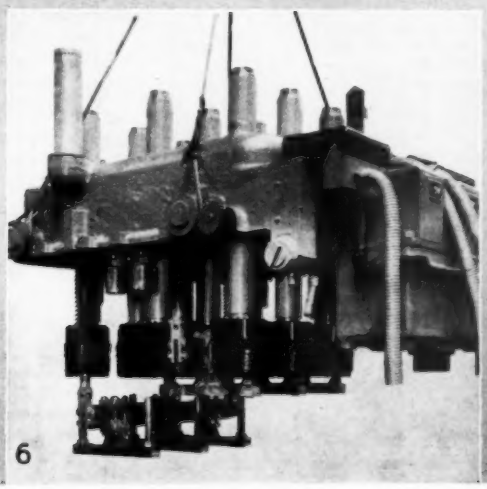
ON Tuesday a petition was presented to the House of Commons on behalf of fifty-seven supply undertakings that the Electricity (Supply) Bill, which had previously run the gauntlet of the House of Lords, should be referred to a Select Committee. A Committee of this class is empowered to take expert evidence which, though often technically helpful, is apt to cause delay. We hope the Bill will be allowed to win through, or lose, on its merits, as this would be a far more satisfactory conclusion than that it should share the fate of so many electrical Bills and be merely "talked out." Had every opportunity—and there were many—been taken to improve and clarify the 1926 Act when a Bill in committee, instead of the putting up of obstruction, in the hope that the measure would go by default, there would have been less trouble in adapting it to practical conditions. In its main provisions of confirming the validity of "temporary arrangements," apportioning costs of indirect bulk supplies, and settling railway electrification questions, there should be plenty of matter for really constructive criticism, briefly expressed.











Ferguson, Pailin Switchgear. **(See page 599)**

1. 33-kV oil isolator switchgear for the N.W. England scheme of the C.E.B. 2. Some upper chambers of the Tir John 33-kV oil-filled switchgear. 3. Heavy-current high rupturing capacity air-insulated metal-clad units for the Edward Lloyd contract. 4. Combined pole-mounting transformer with e.h.p. oil-breaker and l.p. distribution box. 5. Heavy-current 50,000-kVA rupturing capacity l.p. circuit-breaker, without tank. 6. Double circuit-breaker, with cross jet explosion pots, in common tank.

Modern Protective Gear. By C. C. Garrard, Ph.D., M.I.E.E.

The elimination of time elements

TO the consumer of electricity the Central Electricity Board is simply a means of securing a cheaper and more abundant supply of electricity, and thus it is that most discussions of the work of the Board centre round such questions as tariffs, to the neglect of its remarkable technical achievements, some of which were stated to be impossibilities, even by eminent engineers. The event, however, has falsified the fears of these prophets.

Nevertheless, very serious problems have to be solved when a million or more kilowatts of generating machinery is connected in parallel on a system with little reactance to limit short-circuit currents. The greatest of these problems is that of control. While the individual units of plant mutually affect one another but little when connected in parallel, the effect upon the control gear increases in proportion to the total plant connected.

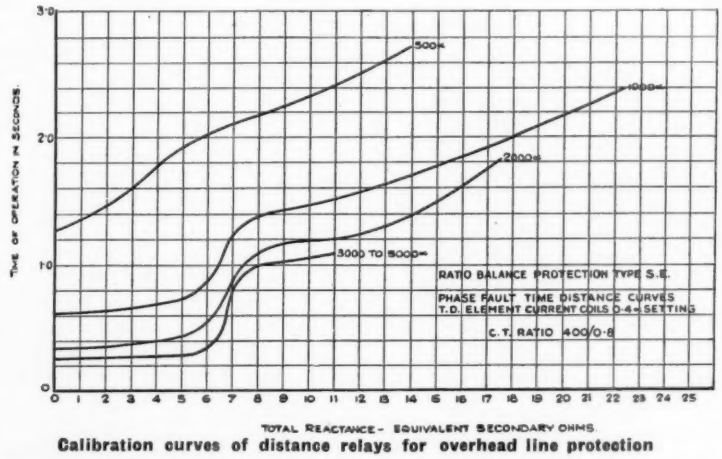
As faults on transmission lines and generating and transforming plant are inevitable, the control gear must minimise their effects upon the general supply. Discrimination is therefore the first requirement of control gear which is to do this; that is to say, the faulty section or apparatus only must be cut out and none of the good portions of the circuit affected. Further, if the ill-effects of faults are to be limited, the faulty apparatus must be cut out very quickly.

Opposing Requirements

Unfortunately these two requirements are to a very great extent contradictory, as the chief methods of transmission line protection hitherto invented have depended upon a varying time of operation to secure discrimination. Thus most of the overhead lines of the grid are protected by distance relays which operate with varying times (between 0.3 and 3.0 sec.), these being longer the farther the fault is away from the circuit-breaker affected. The distance protection, which was developed by Messrs. Reyrolle for the grid, embodies a number of new features especially adapted to secure relatively quick release over the greater part of the length of the feeders. In the interests of economy and reliability, potential transformers have in many cases been replaced by condenser-type potential dividers (made by the Bushing Company, Ltd.) for coupling these relays to the feeders.

It is evidently much to be preferred, however, that a short-circuit of a million and a half kVA should be cleared in a hundredth of a second than in a time thirty times as long, so that schemes of protection involving time-lags are only adopted *faute de mieux*, which must be understood in its economic sense as being for want of a better at the same price. The difficulty is that to secure rapidly acting discriminating protective gear the currents flowing in widely separated portions of the network must be compared by taking proportional samples to the control station by means of pilot wires or other channels.

There are several excellent systems which work on this principle utilising pilot wires, but the cost of the pilot wires becomes prohibitive when long overhead transmission lines are concerned. Hence considerable work has been done in applying other channels of communication to protective gear. Such a channel of communication can be provided by the transmission lines themselves.


TIME OF OPERATION IN SECONDS
3·0
2·0
1·0
0
500∝
1000∝
2000∝
3000 TO 5000∝
RATIO BALANCE PROTECTION TYPE S.E.
PHASE FAULT TIME DISTANCE CURVES
T.D. ELEMENT CURRENT COILS 0·4∝ SETTING
C.T. RATIO 400/0·8
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
TOTAL REACTANCE - EQUIVALENT SECONDARY OHMS

Calibration curves of distance relays for overhead line protection

Carrier-current Communication

For this purpose the communication is by means of high-frequency carrier currents (120,000 cycles per second) which are imposed upon the conductors by coupling condensers. Several installations of this kind are used on the grid, for example, between Bedford and Little Barford and on the line connecting Perth and Rannoch in Scotland. Carrier-current communication can be used not only for protective gear but for supervisory control and telephones.

Another scheme which has been largely used is to employ telephone lines hired from the Post Office. As in such cases the Post Office hires out only a channel of communication and not a specified metallic line, the apparatus must be so designed as to be unaffected by variations of the ohmic resistance of the channel. For short distances d.c. can be used for the communication.

[*Elliott & Fry*

Dr. Garrard is electrical engineer and manager of the G.E.C. Switch & Controller Works, Witton

For longer distances, however (say, twenty miles or over), a.c. at frequencies equal to that of human speech (voice frequency of the order of 1,000 cycles per second) must be employed. This allows the use of repeaters and permits unlimited distances to be dealt with. Here, again, however, economic considerations come in as the Post Office charges are not negligible. Another scheme has, therefore, been developed; this is to use as the channel of communication a pilot embedded in the earth conductor which is employed to protect the main overhead conductors from lightning effects. Such a combined earth and pilot cable has been installed between Perth and Abernethy, and is used for telephonic and protection purposes. Another similar device is the overhead pilot cable suspended from a catenary wire.

All these overhead pilot systems are peculiarly liable to disturbance by electromagnetic induction due to the power current flowing in the neighbouring conductors. This difficulty can, however, be overcome by shielding, the use of drainage coils, or one of the other methods of guarding against interference with communications that have been developed during recent years in connection with extensive transmission systems.

Eliminating Time Elements

The foregoing remarks illustrate the strong trend that exists towards eliminating time elements in protective gear. In order to secure the full effects, however, the circuit breakers which are operated by the protective gear must themselves be quick in action.

Before the arcing tips part the following periods of time elapse: (a) time taken for the mechanism to start moving; and (b) time taken after beginning of movement to clear the arcing contacts. The reduction of these lost times, coupled with a rapid extinction of the arc, are the most important problems facing designers of circuit-breakers for large overhead systems.

The periods (a) and (b) mentioned above depend solely upon the design of the circuit-breaker mechanism and the length of the overlap of the arcing contacts. The additional period required for the extinction of the arc depends largely and firstly upon the physical characteristics of arc rupture, and secondly upon the degree of arc control exercised by the circuit-breaker.

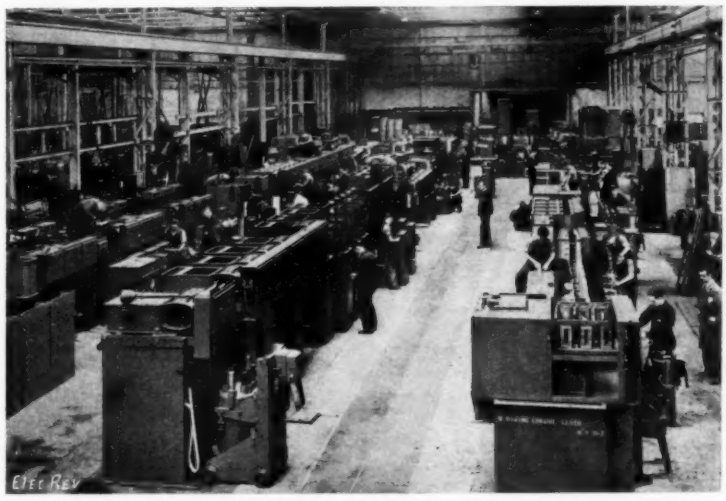
Calorizing

The calorizing process is designed to protect metals subjected to high temperatures from oxidisation or scale by providing a self-forming, self-renewing coating of alumina. Aluminium is fused into the surface of the base metal, with which it forms a homogeneous alloy for a definite depth. Full particulars of the process are given in a small book entitled "Calorizing," published by the Calorizing Corporation of Great Britain, Ltd.

Modern Switchgear Design

Round-tank breakers, high rupturing capacities on low voltage, and arc control

DURING a recent tour through the factory at Higher Openshaw, Manchester, of Messrs. Ferguson, Pailin, Ltd., we were particularly impressed by the predominance of the round-tank oil circuit-breaker in all classes of switchgear, e.h.p., h.p., and even l.p., metal-clad, cellular, truck-type cubicle and sheet-steel cubicle; in the advance which is being made towards dealing with very heavy currents and high rupturing capacities on low voltages; and in the company's method of arc control and its application to some very important equipments under production. The cross-jet explosion pot method of arc control is now used practically throughout for 22,000-V and 33,000-V switchgear, and in many cases for 6,000-V and 11,000-V equipments, of different ratings and designs.

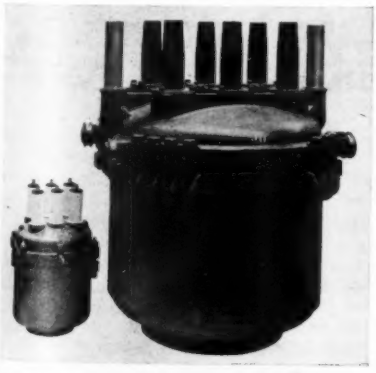


A section of the Ferguson Pailin light metal-clad assembly bay

The Stuart Street

We saw some of the seventy or so 6.6-kV high rupturing capacity circuit-breakers which are to serve in the Stuart Street power station of the Manchester Corporation electricity undertaking. The main generator board with 750,000-kVA rupturing capacity breakers and "on load" bus-bar selection will feed four subsidiary boards with 500,000-kVA rupturing capacity circuit-breakers and "off-load" bus-bar selection switchgear.

One of the duplicate bus-bar generator equipments afforded us a good opportunity to see the dual circuit-breaker in a common tank scheme developed by the company. The two breakers are utilised to change over a circuit from one bus-bar to another without breaking load; the scheme provides in each case a stand-by circuit - breaker and renders it possible to change over a circuit from one bus-bar to another in practically negligible time—an important factor when dealing with emergency switching conditions. It also renders it possible for the change-over from one bus-bar to another to be effected from the control room, without the necessity for the operator to visit the switchroom to change over isolators, &c.



"The family likeness"—a 75,000- and a 750,000-kVA round tank breakers

On a feeder unit we saw how "off-load" bus-bar selection is effected by lowering the circuit-breaker from one bus-bar and replugging it into the other. It is claimed that this method of selection is an advance on the plug changing method, as the change-over can be carried out more quickly and there is no risk of misplacement by the operator of the bus-bar plugging members. To minimise the space taken up by the control gear, a miniature type of control board has been developed for both the generator and feeder switchgear, and as many as eighteen feeder breakers are to be controlled from one panel 3 ft. wide.

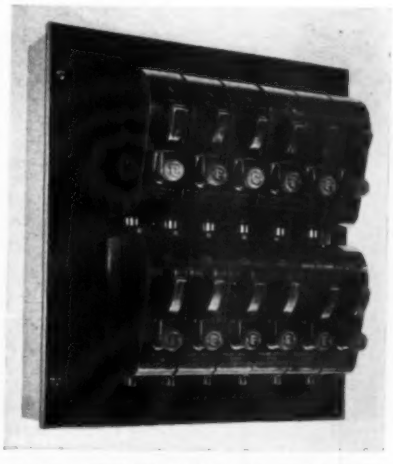
Of greatest interest, however, was the company's cross-jet explosion-pot method of arc control embodied in this equipment. By a circuitous channel in the special head surrounding the socket contact the forces liberated in the generation of gaseous products during the early portion of the opening stroke are utilised to propel a stream of cool oil at high velocity across the contact gap at the moment of zero current pause, thus effectively preventing the re-establishment of the arc.

There are also under construction at the moment some of the nineteen 500,000-kVA cellular main generator switch units and some of the eighteen high rupturing capacity l.p. power station auxiliary switchgear equipments to be supplied to the Kemsley (Sittingbourne) paper mill of Messrs. Edward Lloyd, Ltd. This paper mill is said to be the largest of its kind in the world, and the electrical power plant for its operation will be the largest industrial equipment of its kind installed in this country.

Each e.h.p. equipment comprises a cellular-type housing for the bus-bars, isolating switches and current transformers, and a metal-clad housing for the drop-down breaker, so that there is a combination of the advantages of the cellular lay-out and those of metal-clad design. The metal-clad section of each cell has its own self-contained motor-operated raising and lowering gear for isolating the oil circuit-breaker and raising the top plate to permit inspection of the contacts in the cell without encroaching on the passage-way. To withstand the very great forces between the bus-bars in this high-rupturing capacity equipment compression-type insulators have been adopted on the bus-bars. The selector isolators are worm-and-wheel operated, the hand-wheels being located at a convenient height to permit operation from the ground level. The potential transformers are of the plug isolator type, with screened sockets to enable the potential transformer to be inspected without shutting down the circuit. Cross-jet explosion pots are also embodied in this e.h.p. switchgear.

Each of the 430-V switch units has its own self-contained truck, permitting the raising, lowering and transportation of the breaker, so that it is possible to isolate the breaker from the bus-bars and withdraw the truck for inspection of the contacts in a minimum of time. Further the truck housing gives the board a neat appearance and provides a metal screen between the oil circuit-breaker and the operator. When looking at one of these round tank circuit-breakers we found it a little difficult at first to believe that we were inspecting l.p. equipment.

Mr. Ferguson impressed on us the fact that the switchgear manufacturer's problem was becoming more and more one of dealing with forces due to high currents than to those which are set up by high voltages.

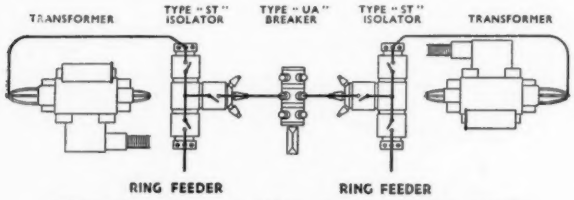


"Dis." board of "TM" l.p. a.c. house service cut-outs

The second section of the 33-kV switchgear for the Tir John power station of the Swansea undertaking is nearing completion. The seven 33-kV duplicate - bus-bar oil-filled metal-clad switch units are to control two 37,500-kVA alternators, four feeders and one house-service set. The bus-bars are arranged on each side of the switchroom, leaving a central passage-way for the removal of the oil circuit-breakers. On each of the alternator and house-service equip-

ments there are two circuit-breakers to permit change-over from one bus-bar to another without breaking circuit, and on each feeder equipment the one breaker is arranged and equipped to facilitate off-load bus-bar selection. Each half of the unit has its own self-contained motor-operated raising and lowering equipment. Here, again, we saw cross-jet explosion pots for arc control.

A special feature of the design is the oil-filling arrangements for all the bus-bars, instrument transformers and connection chambers. All the oil-filled chambers are fed from two con-



Schematic diagram of 33-kV one-switch grid station

servators on each unit, and valves are provided so that the oil can be drawn off from any one phase without interfering with the remaining equipment. Furthermore, each unit has its own self-contained oil-filled system, entirely independent of that on the adjacent units. Connection can be made to an oil cleaning and drying plant, in which case the circulation of oil is such that the cleaned oil is returned to the conservator vessel from which the various bus-bars and oil-filled chambers are fed, the dirty oil being drawn off at the bottom of the chambers. All the chambers are designed for complete phase separation throughout. The bus-bars are insulated throughout their length by bakelite condenser bushings housed in an outer copper tube filled with oil.

High Rupturing Capacity L.p. Switchgear

We were shown a cubicle-type switchboard which is being produced with very high rupturing capacity heavy-current oil circuit-breakers for a large industrial plant in Lancashire. The board comprises three 2,000-A, two 3,000-A and two 3,500-A, 50,000-kVA oil circuit-breakers, which are to deal with a short-circuit current approximately the same as that corresponding to a 750,000-kVA 6,600-V breaker. In common with the heavy-current breakers for the Manchester and Edward Lloyd contracts, the main contacts of these breakers are silvered to ensure minimum deterioration of contact surface during service.

Each breaker of this equipment is operated by the thermal gas closing mechanism developed by the company to permit non-manual operation without the use of solenoid or motor-operating gear, with immediate positive results—an important point when closing on a short-circuit. Operation is initiated by a very small current from a special battery unit which is applied to the terminals of a little heating element in the charging unit, resulting in a rapid gas expansion which actuates the plunger of the closing mechanism. Each cubicle also incorporates its own self-contained raising and lowering screw for the circuit-breaker tank.

There is under construction a unique switching equipment for the Central Electricity Board at Workington. It comprises a 33-kV semi-enclosed outdoor equipment in which one oil circuit-breaker automatically protects the two feeders and the two power transformers, while two three-way enclosed-type oil-immersed isolators sectionalise the feeders and transformers.

Other Notable Developments

We were also interested in a pole-mounting circuit-breaker which has been developed to meet the demand for means for inexpensive rural supply. A unit about to be shipped to Ceylon combines an e.h.p. pole mounting oil circuit-breaker, a small power transformer, and an l.p. distribution box. Apart from ground operation, the breaker can be supplied with a mechanical auto-reclose equipment which permits reclosing after a transient fault, without the necessity of the operator visiting the switch.

Much activity was noted in the light metal-clad switchgear department where the type "BV" air-insulated and "VSB" compound filled units are manufactured. These equipments are produced in ratings up to 250,000-kVA rupturing capacity. Both classes of gear incorporate the type "BR" breaker which has been subjected to innumerable rupturing capacity short-circuit tests, the results of which show the breaker to have a high factor of safety. The equipments occupy a minimum of space and the vertical-isolation breaker can be isolated from the bus-bars without encroaching on the passage-way. Further, each unit has its own self-contained truck with breaker raising and lowering equipment, thus permitting speedy removal of the breaker and inspection of contacts.

Wider considerations apart, it seemed almost ludicrous to inspect in the same works the house service thermal type cut-outs recently developed by the company. After tripping a fault the miniature circuit-breaker can be immediately reclosed without the difficulty of locating and rewiring blown fuses. The size and appearance of these have received special attention, and a number of them can be located in a very small space. This little unit should be useful for controlling small motors and it can be supplied in double-pole and triple-pole patterns.

Electricity and the Building Exhibition. By H. Smith

DURING a visit to the recent Building Exhibition I was struck by the small display of co-operation between the various sections of this great industry, more especially in the case of electricity. Surely some attempt could have been made to show the builders the advantages of erecting houses fully equipped with cookers, water-heaters, wash-boilers, and radiators. The inherent advantages of an all-electric house, built as such, is apparent to everyone, and it would be a slight to the intelligence of the building industry to say that it was not interested.

The architect, too, had a fine opportunity to show what could be done, not just by a display of goods, but by facts and figures about the uses of electricity apart from decorative lighting.

It is curious that in this country there appears to be very little co-operative effort to produce a really comfortable house at a moderate price. In the winter months it is impossible to warm a house of the average type fitted with open fireplaces in every room. If the householder buys a portable fire the only advice he gets is that 2 kW will heat a room with a floor area of about 200 sq. ft. He may not realise the advantages of an all-in tariff, if there is one, with the consequence that he is dissatisfied with electric heating and considers it too expensive for general use, reverts to coal fires and relegates the electric heater to the bedrooms for occasional heating. This leads to prejudice against electric heating in any form.

Manufacturers are to-day turning their attention to the production of more attractive-looking fires, but are not aiming at the ideal, only substituting one form of local heat for another. A fire in each room is uneconomical and not satisfactory.

Is it not possible to design an attractive panel heating system with the panels attached to the walls separating one room from another? In the modern type of house this would not mean a large number of panels, as they could be double-sided and built in. Assume that three were fitted of 500-W loading each, with electricity at ¾d. per kWh, this would cost 11d. for a 10-hour day. It is not, of course, assumed that 1½kW would be sufficient to heat a house up to a comfortable temperature, even with "convected" heat, but it would go a long way towards it. Then when each room is occupied a small radiant heater could be switched on, or further panels, whichever were preferred.

The present generation which prefers what it likes to call "the cheerful effects of a coal fire" will not last for ever. If electricity is cheap panel heating will cost no more than any other form of central heating, and it is not necessary to keep the whole of the house at a temperature of 65 deg. F. In a house in which coal fires are used the difficulty of warming is the draughts caused by the chimneys. A house using only panel heating would require very small loading, and if the panels were sectionalised the householder would be able to leave a small load on all night so that the temperature drop to the next morning would not be excessive. It is, of course, no use just building a show house and leaving it at that; facts and figures should be available in simple terms of comparative cost of running.

With regard to cooking, intensive research is required to produce quick boiling plates and thermostatic oven control of a satisfactory nature. Water heating is easily fitted into a new house. Other fixtures could be a washing machine, or boiler, and if the price of the house warrants it, a refrigerator as well.

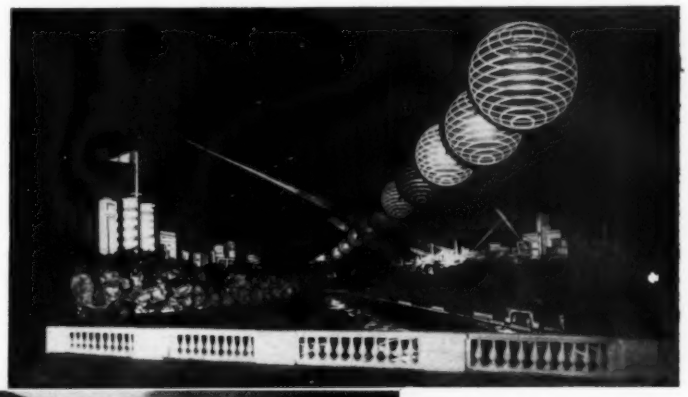
What is the reason for the apathy of the builder and architect towards all-electric houses? Statistics show that this type of house sells well. It is certainly not the place of the builder and architect to approach the electrical manufacturers. With the proposed new housing programmes for the next few years manufacturers, supply companies and contractors should, with a little extra energy, be able to reap a rich harvest.

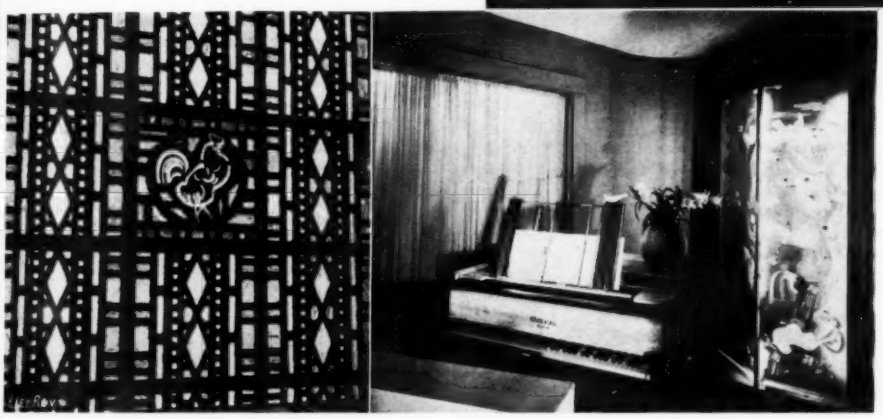
A French Lighting Exhibition. By S. H. Kahn

THIS year's Salon de la Lumiere, to be held in Paris, differs in many respects from the first one held last year. It is more ambitious and greatly improved. Last year we saw a show of lighting equipment; this year there is an exhibition of lighting application. Electricians really have a small place in the Salon; decorators and architects take the lion's share.

Lighting now plays a very important part in interior and exterior decoration. Such decorators as Pierre Charreau, Mallet Stevens, Herbst, Jean Pascaud and a number of others, know just what part light should play in the decoration of the home. They realise that one can do more to enliven an interior, to introduce novelty and to lighten tone with light, than by any other means. The illumination of picture frames and fine glass screens illustrates how ingenious a decorator can be. In many cases light is introduced into the most unusual places.

A piano room is illustrated herewith. Instead of the light being over the music, it is placed at either side. The lighting of this room is also original. The piano lights are supplemented by an illuminated screen with excellent effect.





Above: Design for the 1937 illuminations. Left: A chipped glass wall with exterior lighting. Right: The lighting of a music room

Pierre Charreau, the architect of a house built entirely of glass, shows how he would light a modern home. He prefers his lighting to come from without rather than from within. By placing powerful lamps and reflectors outside the house, he produces adequate well-distributed lighting through the walls.

Exterior lighting has captured the imagination of many decorators—not necessarily outside the house, but certainly outside a room. One partition wall, for example, in chipped, tinted glass, and illuminated from without, throws a soft light into the room. This is also illustrated.

Most of the creators of lighting equipment, such as Jean Perzel, Maxonade, Jean Luce and Francis Paul, are employing semi-indirect in preference to totally indirect lighting; the latter is generally too expensive to run and the results are not always satisfactory.

There are several novelties to be seen. One of these is a lighting project for the 1937 Exhibition. This is the work of Mallet Stevens. Those who visited the 1931 Colonial Exhibition will remember the remarkable lighting effects. Monsieur Mallet Stevens has produced a noteworthy design with the aid of Monsieur André Salomon, who looked after the lighting of the house which he planned near Roubaix, regarding which an article already has appeared in these columns.

Rotherham's Unorthodox Tramcar

AS new stock was required for a particular route on the Rotherham tramways which permitted the operation of single-ended rolling stock, Mr. Sykes, the transport manager, in conjunction with the English Electric Co., Ltd., has developed and patented a vehicle of modern appearance incorporating all the latest improvements in bus and tramcar design. The accompanying illustration shows the graceful lines of the car, the front of which follows closely the most modern bus practice.

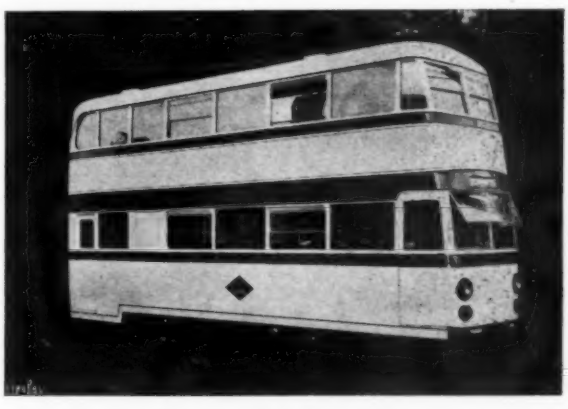
The body is mounted on a four-wheel truck, and has a large rear vestibule so arranged that passengers may step directly into the vestibule; a further single step leads to the saloon. The lower saloon is arranged to accommodate twenty-seven and the upper saloon thirty-six passengers, the seats being of the fixed back type with very deep cushions.

The body is built of all-steel sections and teak, and the separate underframe is of welded rolled-steel sections. Particular attention has been paid to the ventilation of the car.

Thermostatically controlled tubular electric heaters are installed on each side, and the floors of both the upper and lower saloon are covered in linoleum; polished mahogany is used for the interior wood work and the lining panels are covered with scratchproof rexine to tone. The ceilings of the saloons are finished white relieved by polished mahogany mouldings. The furniture is principally chromium plated, with the hand rails covered in non-inflammable material. The seats in the upper saloon have leather covered cushions and backs to tone with the inside finish. The lower saloon cushions are covered in moquette, the seat backs having leather facings with moquette panels arranged to tone with the inside finish.

The illumination of the car is arranged so that passengers can read in comfort. The inside lighting fittings are of the rectangular panelled glass type with chromium-plated frames. Additional lights of the same pattern are provided in the vestibule so as to illuminate the steps adequately.

The driver has an enclosed driving compartment at the leading end, to which access is obtained by means of a door on the offside; another door immediately behind the driver leads into the saloon. In the rear vestibule there is fitted a controller and hand brake gear so that in emergency the driver can drive from the rear end. When this becomes necessary the emergency door fitted on the offside comes into use and the hinged doors across the main entrance are locked.



The new Rotherham tramcar

Electrical Irrigation in India

IN order to acquaint themselves more fully with the principles of hydro-electric development in the United Provinces, India, coupled with an electrical irrigation project recently approved by the Government which will involve the expenditure of over £2,000,000 during the next four years, representatives of electrical engineering firms and pump manufacturers met informally last week at India House to hear the scheme outlined by Mr. W. L. Stampe, C.I.E., chief engineer and secretary to the Government Irrigation Branch, U.P., who is about to return to India after leave in England.

Being without mineral and other resources for industrial development, the United Provinces are essentially agricultural in character. Irrigation is thus a main factor in their productive crop yield. For this purpose the waters of the Jumna, Ganges, and Sarda rivers have now been fully utilised. Similarly the minor rivers Ramganga and Kali Nadi have already been harnessed for electric pumping into canals.

There is no possibility of extension by means of gravity canals in the west and central districts of the province, but considerable tracts remain in need of irrigation. To satisfy this want the State is developing a scheme of tube well pumping from the subsoil, the economic feasibility of which has been proved by data obtained experimentally over a period of several years.

The pumping is done electrically with " hydel " energy from the grid distribution system established in 1930. Hydro-electric generating stations built on the main gravity canals have furnished power at a retail rate of seven pies (about ¼d. per low-voltage kWh) throughout the eight western districts of the United Provinces. This rate includes the cost of generation; transmission at 66 and 37 kV by main feeders to distant groups of wells; thence by 11-kV rural branch lines to individual wells, designed to carry 100 kW for ten miles and erected with local materials at not more than £110 per mile; and also the cost of transforming down to 400 V at the tube well motors.

Out of 28,000 kW, the ultimate generating capacity of the ten canal falls available, 10,500 kW has been allocated for State wells and it is anticipated that a further 1,500 kW will be available, 12,000 kW in all, or sufficient at 8 kW per well for 1,500 tube wells of the standard type. As each well is capable of irrigating 130 acres of cane and 250 acres of wheat yearly, a total increase of some 200,000 acres of cane and 400,000 acres of wheat irrigation can be effected in the grid districts. The importance of the grid scheme for the advancement of provincial agriculture can thus be visualised. Apart from irrigation, power will also be available at the 1,500 transforming points for processing the crops thus produced, *e.g.*, crushing sugar cane, centrifuging juice, grinding wheat, ginning cotton, hulling rice, &c.

The " Standard " Well

Wells yielding 1.5 cusecs each (33,000 gallons per hour) are sunk with a spacing of one per 1.5 sq. miles, or 1,000 acres of average culturable country. The water distribution system consists of one or two miles of radiating " guls " (channels) per well and the cultivator buys the water on a volumetric basis at the well at a specified rate per kWh of electricity consumed at the meter. With water priced at not more than Rs.2 per acre for wheat and cotton (100,000 gallons) and at Rs.3 for sugar cane there exists a ready demand for irrigation for not less than 2,000 to 2,500 hours per year in tracts enjoying normal rainfall.

In 1934 the State standardised a typical volumetric well on the basis of Rs.5,000 for a 1.5 cusec yield from a 6-in. tube with 80 ft. of strainer sections, a centrifugal pump directly coupled horizontally to a 12.5-h.p. motor, one mile of distributing guls, a share of a service road, and an inspection house.

This is at the rate of Rs.3,333 per cusec, inclusive of overhead charges, or about half the price paid in 1931. In the current year 180 wells of this type are being sunk. In 1935-36, 260 wells at a cost of 10 lacs (works) and an increasing number in the following years, are proposed. The Government has approved of the principle of tube-well irrigation in Moradabad and Meerut, and has agreed to exploration on a gradually increasing scale in Budaun, Muzaffarnagar, and Bulandshahr.

Efforts are now being made to reduce the cost of standard tube well equipment by improved design, mass production, and increased competition between contractors. Mr. Stampe is anxious to learn from manufacturers whether more suitable types of pumps and motors are available and also what would be the most economical types and sizes of generating plant to install for future extensions.

The existing electric grid is serving about seventy towns, the domestic demand being chiefly for lighting and driving fans. About 150 farms are using electricity for pumping, grinding, and crushing, the maximum demand averaging 100 h.p. per town. The diversity factor is large, the connected load being about three times the peak, but as tube well irrigation spreads, coupled with crop processing at the transforming centres, the pumping load will become the dominant factor.

Future Activities

Four canal hydro-electric generating stations are in service, a fifth has just been completed, and five more remain to be built to provide a total of 45,000 h.p. The largest size of turbo-alternator so far installed is 1,500 kW, but 3,000-kW sets may be needed in future. The maximum hydraulic head available is between 10 and 16 ft. During the next five to seven years it may be necessary to build oil or steam driven generating stations to operate in parallel with the water power plant for carrying peak loads and as standby in extra dry periods. Since these standby stations would not be operated for much more than three months per year, low running cost would not be nearly so important as low capital cost.

Apart from crop processing, for which the potential power demand is indicated by the fact that 500,000 acres of sugar cane may yield up to 20 tons per acre, involving the crushing of 10 million tons of cane per year, the demand for power is likely to be considerably increased by the most recent development and the irrigational pumping scheme.

To provide water in the southern areas where it would not be economical to pump from great depths under the subsoil, a scheme of " substitution by conversion " has been evolved. The general idea is to pump from wells into canal fed distributaries in the tube well zone, thereby releasing canal water for carriage to other tracts where water is scarce and where tube wells are not feasible, for geological reasons. This scheme is at present in an experimental stage. The Daurala distributary taking off the Ganges Canal in the Meerut district is being converted to tube well supply and its 88 cusecs are being taken down the main canal and Mat branch to the Muttra district for utilisation there.

Projects are being evolved on similar lines for other channels and should they prove successful, there would be no engineering reason why canal irrigation should not be greatly expanded in dry non-tube well tracts, such as Muttra, Agra, and Etawah, by providing additional water from tube wells in the more fortunate districts of Meerut and Bulandshahr. For such conversion schemes a large size of tube well is adopted, at present 2½ cusec wells. These are sunk along the distributary to be converted at distances of about ¼ mile apart, and are energised by a local branch line from the grid. The capital cost of such wells is from Rs.6,500 to 7,000 each.

The Industrial Design Exhibition

THE encouragement of a standard of good quality in domestic design is aimed at by the organisers of the Exhibition of Contemporary Industrial Design in the Home, which is being held at Dorland Hall, Regent Street, S.W.1 (October 18th to November 3rd). Electricity for many purposes is demonstrated and there is an interesting all-electric ensemble (see illustrations on page 607). This exhibit, designed by Mr. Walter Goodesmith, A.T.C., A.R.I.B.A., architect and consulting engineer, was sponsored and supported by the British Electrical Development Association. It comprises the more mechanised parts of a modern house, an office, and a display of photographs and charts of electrical interest.

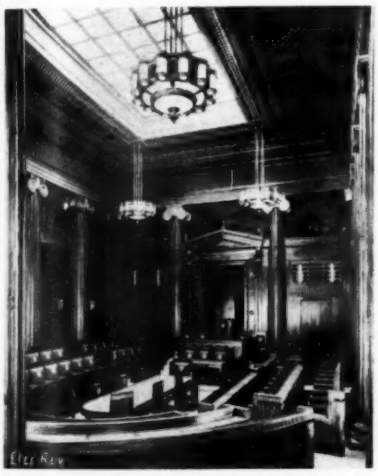
The equipment of the home is an excellent example of tasteful layout. The hall is illuminated from a flush panel fitting with dimmer to control the intensity of light (Messrs. Troughton & Young, Ltd.). Close inspection of the living room reveals a glazed lighting panel, a Baird high-definition television receiver and a G.E.C. radiogram, all flush with the wall. A double hatch connects with the kitchen (which is replete with a variety of electrical apparatus including, apart from cooking equipment, a Ferranti radio set and Edison Swan vacuum cleaner. There is another kitchen measuring 5 ft. by 4 ft. 6 in., designed to show how small an all-electric kitchen can be made. Despite the confined space it contains a Jackson cooker, an Electrolux refrigerator, a Hotpoint swivel wall fire and a vacuum cleaner, a 1½-gallon water heater (Berry's Electric, Ltd.), a G.E.C. electric iron, and a Synchronome clock. A ray room adjoining the bathroom is equipped with an ultra-violet ray apparatus (British Hanovia Quartz Lamp Co., Ltd.), and G.E.C. vibro-massage and hair-drying appliances. In the laundry there is a Hotpoint washing, wringing and ironing machine. A control room for meters, fuses, circuit-breakers, &c., is so designed that it can be inspected either from inside or outside the house.

An attempt to simplify the housing of the numerous mechanical and electrical parts is seen in the model office. The equipment is contained in a " technical leg " of the desk, allowing easy access for inspection. Plug-in connections from the floor are provided. The telephones, batteries and clock were supplied by New System Telephones, London, Ltd.

The Swansea Civic Centre

AN excellent example of up-to-date methods in electrical installation work in public buildings is to be seen at the new Swansea Civic Centre which was officially opened on October 23rd by the Duke of Kent. The new building occupies an imposing position overlooking Victoria Park. Its design is essentially modern though not too severely utilitarian, the tall practically plain tower in particular standing out well above the rest of the building giving it a dignified and solid appearance.

Every effort has been made to ensure that the electrical equipment, particularly the lighting apparatus, should be in keeping with the rest of the building. A separate sub-station feeds the whole of the electrical services, mains being brought into a position beneath the Assembly Hall for the normal electrical service, with special h.p. mains into the boiler house for the heating service. All the outgoing mains are controlled from the switch room beneath the Assembly Hall, and two mains run from this position to each of the four blocks, *i.e.*, Municipal, Civic, Assembly Hall and Law Courts. Primarily these mains are utilised for supplying the lighting and power in each section, but main control units are provided with interconnecting links so that the whole of the load in any section can be put on to one cable in case of emergency.



The Council Chamber

All the electrical services other than the main cables are wired with v.i.r. cables enclosed in solid drawn conduits. Each fuseboard both for lighting and power in each section is brought back to its separate control switch on the main panel in the basement of each section.

The Lighting Arrangements

A neat and clean illumination effect is obtained in the offices of the Municipal Buildings generally by the use of white opal spheres suspended from chromium-plated rods.

In the principal rooms, such as the Council Chamber, reception rooms, etc., there are direct lighting units, each of which has been specially designed by the architect (Mr. Percy Thomas, of Cardiff), for its particular situation; gilt bronze, natural bronze and chromium-plated finishes have been employed. The Committee Rooms are all indirectly lighted by means of strip-lighting round all the walls concealed in the cornice.

In the main entrance hall and in the ante-room, in addition to the direct lighting, are heavy bronze fittings with glass bowls providing indirect lighting and bringing into prominence the rich colouring of the ceilings.

The Assembly Hall is illuminated by eight specially designed lanterns, each about 7 ft. high in gilt bronze, while the orchestra and stage are provided with floodlighting from the main roof. Eight sliding panels in the coffers of the ceiling are operated by gearing from the hall level; the floodlights are fixed above the panels and are also controlled from the stage level. The Law Courts are lighted by fittings similar to those used in the Municipal Buildings, but in the two large Courts there are four spheres 22-in. in diameter suspended from chromium-plated rods.

All the principal lighting fittings throughout the building are provided with winches so that they can easily be lowered for cleaning and replacement. In case of failure of the main electricity supply, a "Keepalite" lighting system has been installed in the Assembly Hall and all the main exits and staircases are connected therewith.

Heating and Ventilating

Electrical thermal storage has been utilised for heating the whole of the building, and electric fans are provided throughout the building in connection with the ventilating system.

The central plant consists of two Sulzer electrode boilers each of 850 kW capacity when connected to a 6,000-V 3 phase supply. The boilers work in conjunction with two hot water storage vessels each 11 ft. in diameter and 35 ft. long, having a total capacity of approximately 40,000 gallons. The water in these vessels is heated to a maximum temperature of about 240 deg. F. between 7 p.m. and 9 a.m. and is circulated during the day from 9 a.m. to 7 p.m. to the heating system. A thermostatically controlled mixing valve is installed to maintain the temperature of the water supplied to the heating system constant at a figure depending upon the external temperature.

The domestic hot-water supplies are dealt with by circulating hot water from the boilers during the night to two storage calorifiers and by circulating hot water from the storage vessels through the same calorifiers during the day. Provision is made so that in case of emergency the heating system and the hot-water supplies can be dealt with from the boilers direct without the necessity of first heating up the storage vessels.

The electrode boilers are provided with automatic load regulation which keeps the boiler load constant at any required figure irrespective of the variation in conductivity of the water with altering temperatures. In addition to this the boilers are fitted with safety devices to cope with any emergency.

Brangwyn Hall

Regulation of the load is effected by means of movable insulating sleeves surrounding the electrodes. These sleeves are connected to a central shaft passing through the top cover of the boiler and connecting to a hydraulic servomotor mounted on the top of the boiler. This servomotor is fed with water

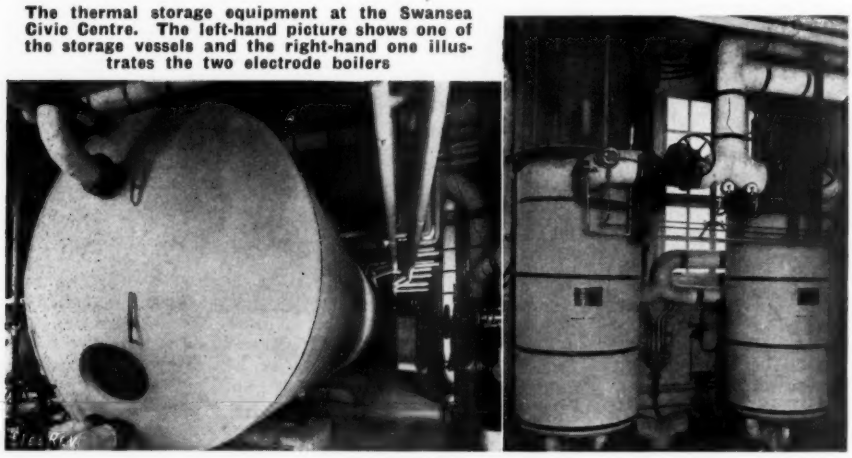
from the cold water supply system to the building. Arrangements are made so that the boiler load regulation can be effected by hand in the event of the automatic control gear being out of order. The boilers are controlled by means of stationary cubicle type oil-immersed circuit breakers each fitted with no-volt and three overload releases and an earth leakage relay.

The thermal storage plant was designed and installed by Messrs. Sulzer Bros. (London), Ltd.

A complete vacuum-cleaning plant has been installed. A system of synchronised electric clocks comprises a main transmitter with dial on the tower, and sixty clocks throughout the various departments. In the Committee Rooms and Mayor's Parlour, etc., special dials have been provided.

There is a Post Office telephone exchange in the building with 124 lines to various departments, and in addition there is a complete 150-line automatic telephone system. Provision has been made for floodlighting the whole of the building, mains having been laid during the progress of the work and boxes provided in the lawns surrounding the building for connecting up the lights.

The thermal storage equipment at the Swansea Civic Centre. The left-hand picture shows one of the storage vessels and the right-hand one illustrates the two electrode boilers



The general contractors for the whole of the electrical work were Messrs. H. J. Cash & Co., Ltd., the contractors for the heating and ventilating work being Messrs. G. N. Haden & Sons, Ltd., Trowbridge.

The special fittings for the whole of the building were made by Messrs. H. H. Martyn & Co., Ltd., Cheltenham, and Messrs. Troughton & Young, and those in the Reception Room by the Edison Swan Electric Co., Ltd. All the office lighting fittings were supplied by the General Electric Co., Ltd. Other manufacturers concerned included Messrs. Gent & Co., Ltd. (clocks and clock tower); Messrs. Dod Bros., Manchester (vacuum cleaning plant); and the Reliance Telephone Co. (automatic telephones).

The floodlighting equipment was supplied by Messrs. Siemens Bros. & Co., Ltd., and the General Electric Co., Ltd., the installation work being carried out by the Swansea Corporation Electricity Department under the direction of Mr. J. W. Burr, the borough electrical engineer.

Sectional Sheet-steel Poles

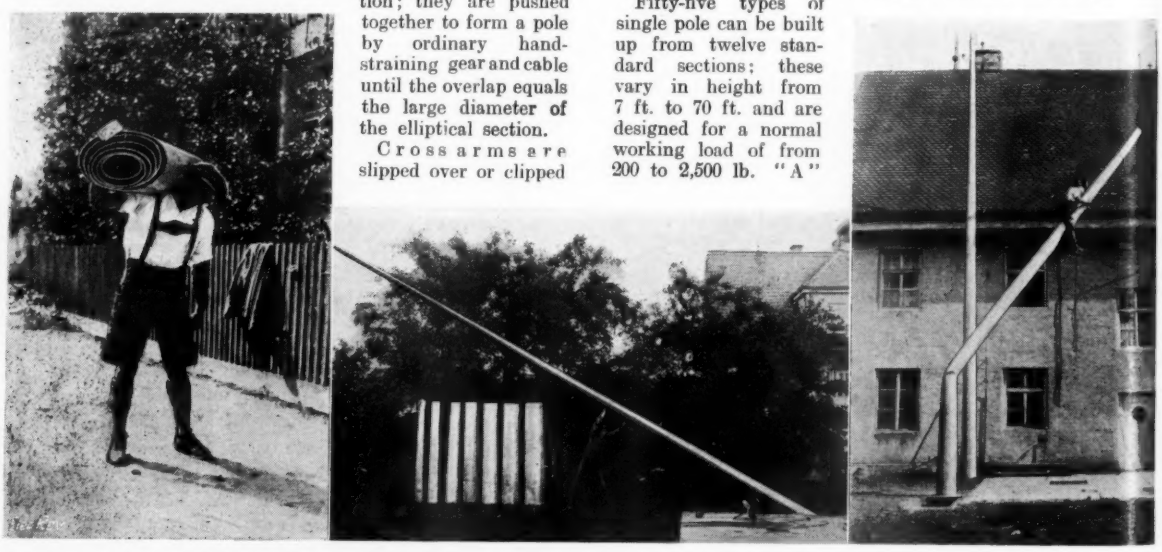
TESTS have successfully been carried out by the Department of Scientific and Industrial Research on tapering poles for power transmission and telegraph lines which consist of welded and interlocking sheet-steel sections, each two metres long, conical in shape and elliptical in cross section; they are pushed together to form a pole by ordinary hand-straining gear and cable until the overlap equals the large diameter of the elliptical section.

Cross arms are slipped over or clipped to the mast head without forming pockets for condensation. It is claimed that the design ensures an even distribution of stresses with a high elastic and torsional limit and that as the poles are placed with the oval section across the line the factor of safety is such that "A" poles would be required only at acute bends or as terminal poles.

Their weight is said to be from one-third to one-quarter of that of wooden poles and a less proportion of the weight of steel and concrete poles. As the sections can be put into one another, transport is greatly facilitated. Other advantages claimed are: A 30-ft. pole can be carried and also erected without tackle by one man; the span length can often be increased by 30 per cent.; there is very little expense in maintenance; damage does not cause collapse but only buckling of a replaceable section which allows a line to be retained in commission pending repairs; a life double that of wood poles of comparable first cost; easy climbing in any weather with special irons; a higher resistance to corrosion than mild steel or even steel with a copper content of 0.3 per cent.

Fifty-five types of single pole can be built up from twelve standard sections; these vary in height from 7 ft. to 70 ft. and are designed for a normal working load of from 200 to 2,500 lb. "A" poles are constructed for normal loads three times those of the single poles. The poles selected for the test stood an excess load appreciably above two and a half times the normal load.

The poles are constructed of special steel sheets of a tensile strength of from 60 to 70 kg. per sq. mm. The sheets are cut to shape and rolled into conical cylinders which are next fastened to formers and held in position by a calibrating ring for twin spot welding. Afterwards the overlapped joints are seam-welded by a roller step-by-step process and then pressed into oval shape and following pickling they are hot (spelter) galvanised. Finally the butt-end section is hot-lead or bitumen coated. The cost of the complete plant for an output of 1,000 poles per month is about £1,500. Further particulars may be obtained from Mr. E. C. Kny, 19, Palace St., S.W.1.

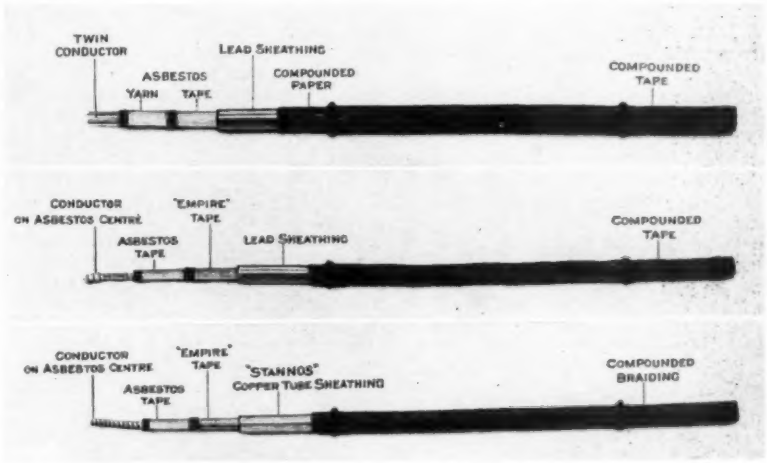


Left: A "nest" of sections showing the ease of transport. Centre: One man erecting a standard telegraph pole without tackle. Right: A pole which was tested to destruction showing how it buckled instead of collapsing

Electrical Heating in the Garden

THE use of electricity for heating garden frames and greenhouses, for forcing the growth of flowers and vegetable produce, is increasing steadily. The flexibility and ease of control possible with this form of heating produces consistently satisfactory results with the minimum of trouble and effort, thus proving commercially advantageous to professional market gardeners and nurserymen, but there is no reason why, with the proper equipment, they should not also be available to the amateur. The advent of autumn with its lowering temperature and chilly nights brings the subject into prominence, and in many districts encouragement is being offered by the reduction of electricity tariffs for steady night loads of this kind.

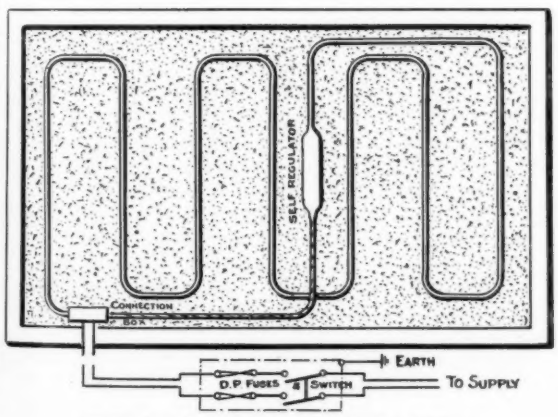
In large greenhouses the method usually adopted comprises a system of hot water pipes fed by a coke boiler. Electric immersion heaters, thermostatically controlled, can with advantage be employed in place of the usual boiler, as they enable a definite range of stable temperature control to be obtained without especial attention. Electrical resistance units can also be used for air heating in frames and hothouses, each unit consisting of a resistance wire wound on an insulating and heat resisting rod and hermetically sealed in a metal tube. This form of tubular heating, arranged with multiple switching, enables various temperature levels to be attained.



Above: 700-W twin core soil-heating cable. Centre: 200-W single core. Below: 200-W single core air-heating cable

The improved growth of plants that can be produced by proper control of the soil temperature is well known. Bottom heat is required for this purpose and is most conveniently generated by electric cables buried below the soil, the method being particularly applicable to hot-beds in garden frames and greenhouses. Cable can also be used for air heating, the soil in the frame being removed, or a combination of bottom heat for the soil and a length of cable placed around the frame above soil level to keep the air at a moderate temperature.

As a precaution against possible damage due to prolonged



Method of laying cable in a garden frame

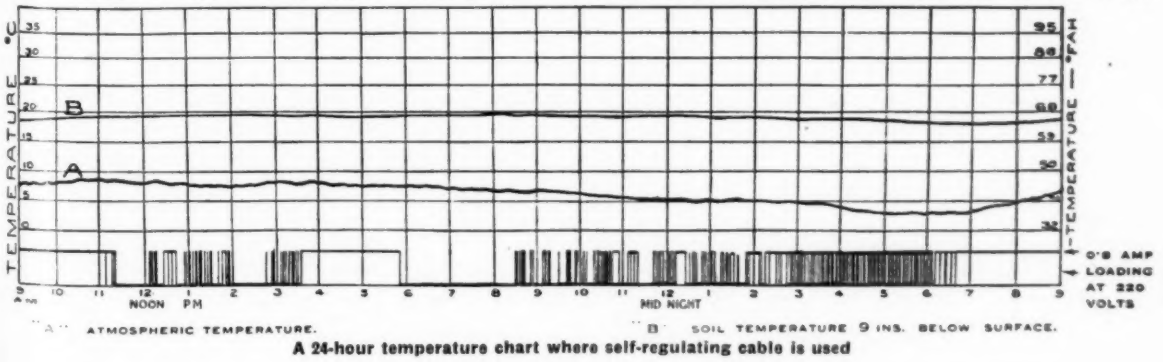
frosts it is advisable to have some automatic control of the heating. This can be done by means of a thermostat which cuts the current in and out as the soil temperature falls below or exceeds the given limit. A recent innovation comprises some such device as part of the actual cable itself, thus making the cable self-regulating.

These cables are made with conductors of some particular resistance alloy, enabling a reasonable temperature to be attained with fairly low current, without variation of load with alterations in temperature. The insulation material consists mainly of asbestos with an outer covering of paper or empire tape, and is lead cased and further protected by a specially compounded tape as a safeguard against the possible action of chemical manures, &c. Various types of cable are manufactured by Siemens Brothers & Co., Woolwich. For heavy loading a twin conductor is employed, the wires being jointed together at one end and sealed in a lead cap; thus only one end need be brought to the supply connections. This 700-W type is suitable for heating fairly large areas, the standard length for 200/250 V being 50 yards. The smaller 200-W type is made up for the standard voltages in 10-yd. units.

The cable is placed at the bottom of the frame in an inch or so of sand covering a thick bed of coke breeze or cinders, which provides efficient drainage and heat insulation. The sand helps to produce uniform heating, the cable being laid in zig-zag formation with the smallest possible spacing between turns to cover the given area effectively. The mains connection should be a properly protected cable. The lead sheathing should be efficiently earthed, and it is advisable to fit a double-pole switch with fuses in the circuit.

Plant growth with and without soil heating

With regard to first cost, the most expensive item is likely to be the fitting up of the cable and supply mains, and this cost will be considerably lessened if the frame can be placed in close contact with the back or sides of the dwelling house. It is as well to provide a heating capacity of at least 10 W per square foot in order to raise the soil to the required temperature fairly quickly, although far less will be necessary to maintain it at a given limit, probably from 4 to 8 W per



A 24-hour temperature chart where self-regulating cable is used

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

What is the Nature of Electrical Insulation ?

THIS is the question Professor W. M. Thornton attempted to answer in his inaugural address as president of the INSTITUTION OF ELECTRICAL ENGINEERS in London on October 25th.

There is at present no theory of dielectric behaviour that covers all the facts. Debye's dipole theory of molecular polarisation seems to be the most promising, but Professor Thornton thinks that the final solution of the problem will be found by an application of the methods of wave mechanics to an analysis of the internal and external fields of molecules, as revealed by X-ray and cathode-ray spectrography, and possibly by a new method which he described in his address.

The most perfect insulator is the ether of space. Gases with molecules a few millionths of a centimetre of ether apart are still good insulators. Some liquids with even closer packing are better still, and certain solids with every degree of density from india-rubber to the diamond are the best of all material substances. But there is a fourth insulating state, distinct from any of these, about which very little is known, yet which dominates more than any other factor the insulation technique of present high-voltage practice. It is that of the moisture films that exist unseen on the surfaces of all solids exposed to the atmosphere.

The resistivity of surface insulation is defined as the resistance at a given temperature and hygrometric state between the opposite sides of a centimetre square that are at right angles to the field along the surface. The surface resistance of an area is therefore independent of the size of the surface, depending only upon its proportions. When the film consists of moisture deposited from the atmosphere its resistivity has values from about 10 megohms at dew point to as much as a "trillohm" (10^{18} ohms). The moisture is held on the surface by molecular attraction of the kind known as adsorption. When dew point is approached it may form a continuous film, but when the surface is nearly dry it is discontinuous and at most a few molecules thick, entangled in the molecular pits of which even glazed surfaces consist. On glazed surfaces of porcelain the films have a dual nature, one part having the characteristics of pure water, the other of a partial or saturated solution of the glaze. If dust deposits on the surface it also enters into semi-solution.

Field Deflection

Professor Thornton has shown recently the striking manner in which invisible moisture on a glazed surface can deflect an electric field, even when the surface resistivity is over 100 megohms per cm^2. This, when it is able to alter the distribution of the field, no doubt plays a part in the flash-over of line insulators, but it may also play a part in the arcing-over that sometimes occurs in air-break switches or in switch cubicles. This is usually thought to be due to ionisation of the air space or to high-frequency oscillations. Insulating barriers have in certain cases only made matters worse, and it is possible that the reason for this is the manner in which the electrostatic fields that determine flash-over are led by moisture films over the surface of the switch chamber and exposed insulation. The remedy is to paint the insulating parts of the case or cubicle with hard bitumen compound or a similar non-hygroscopic covering. There is always such a film of moisture on solids in contact with moist air.

A recent series of papers on electrical discharge in gases by Dr. J. D. Stephenson from the president's laboratory contains new facts which Dr. Thornton believes to be of the first importance. These may be summarised as follows: (1) A gas breaks down when the number of negative ions between the electrodes reaches a certain value that is the same for all gases. (Spark discharge has been shown to consist of a thin luminous line of carriers, thrusting out from the negative pole until it reaches the positive and then thickening as a semi-arc is struck.) (2) The gradient at which breakdown occurs is the same for corona discharge as for sparks between parallel plates. This shows that corona and spark discharge are essentially one, differing only in their manner of causation, while a gas engine will run quite well when the ignition sparks just fail to pass, though a corona glow appears.

Dr. Stephenson found also that high-voltage spark discharge between parallel plates at pressures of 100 to 200 kV could be repeated many times with a voltage difference of no more than 1 in 1,000 between successive sparks; that the electric strength of air is in fact a physical constant comparable in accuracy of determination with most of the constants of nature.

New Ionisation Facts

On the electrical theory of matter the chemical bonds between atoms forming a molecule are the mechanical forces due to electrical attraction, *i.e.*, to the internal electric fields. These bonds, though exceedingly strong, are elastic, and an electric wave motion such as that of electrons passing across a molecule can set the charges of its atoms in vibration so that it absorbs energy from the wave and may be ionised.

Dr. Stephenson found that when the breakdown strength of each gas was plotted against its mean free path the gases he had examined fell into two well-marked groups.

The electric strength of a gas in the upper group is exactly twice that in the lower, or the mean free paths of gases in the two groups having the same electric strength are in the same 2:1 ratio. This new fact in the passage of electricity through gases has still to be explained. It can only occur through a difference in the electron mean free paths and provides a new means for comparing the electric fields of molecules, when the ionisation is so intense that the gas is on the point of breakdown.

An electron following a path that just misses a molecule must go twice the free path before it can strike another, and in doing so it acquires twice the energy that it would have had if it had been stopped at the first molecule. But if all gases in a group require the same energy of collision and ionisation when breakdown is about to occur, it follows that only half the field is necessary for electrons that travel twice the first distance.

Just as there is stepped ignition of explosive mixtures by electric sparks, so there is stepped ionisation according to the type and magnitude of the electric field of the molecules. The passage of an electric spark through air or an explosive mixture is complete before the molecules begin to move and, therefore, before chemical combination begins. The spark leaves in its track a number of molecules ionised by collision as the electrons pass. The manner in which chemical combination between these activated molecules subsequently proceeds depends on the relative numbers of oxygen and combustible molecules, but the essential point is that ignition of any gas by a spark is determined by the ionisation that occurs during its passage and not by the heat generated in the spark.

The observations described should provide material by which to test how and why the substitution of one atom for another in chemical compounds affects so profoundly their electric breakdown strength.

The mechanism of electrical breakdown in liquids is probably not by collision, but by an action resembling intermittent electrolysis. If they were perfect conductors they would be opaque, and it is to the modification of the elastic forces that we must look first for an explanation of electric breakdown.

Under the influence of an applied field the molecular struc-

Electric Heating in the Garden (*continued from previous page*)

square foot, depending upon the final maximum temperature and the situation of the frame. A great deal of electrical energy can be saved by paying proper attention to heat insulation and, in addition, to a good bedding of breeze or cinders about 6 in. or so in depth below the soil. The sides should be well banked with similar material to within a few inches of the top and extending well below the soil level. Covering the top with canvas or sacking during the colder nights will also help to reduce wastage of heat and thereby increase the general efficiency of the frame.

Heating the soil quickens seed germination and encourages growth at periods when the ordinary ground temperature is much too cold for cultivation purposes. By forcing the growth of plants steadily in this way and possibly transplanting them to other beds of lower temperatures, thus gradually hardening them off, the final products are ready for gathering long before the normally grown supply is likely to be available. Catching the early market in this way means definite financial gain to the commercial grower.

For the amateur gardener there is an extra pleasure in having home-grown produce out of season, and the hot-frame provides additional interest to an already absorbing hobby. Self-regulating soil-heating cable overcomes the grave disadvantage of having to bestow so much personal time and trouble on the heating arrangements as it maintains a steady temperature without attention.

ture is distorted, as shown by electric double refraction. To tear an electron from a molecule by a static field requires an intense gradient, and the phenomena of dielectric hysteresis which begin to be important in liquids show that there is an internal field of mutual action long before breakdown.

Dielectric polarisation in all the materials examined has two parts, a perfectly elastic component that is transmitted at the velocity of light or electromagnetic waves in the medium, and an effect resembling "elastic afterworking" that is the cause of the residual charge observed in all non-homogeneous insulators. A solid dielectric may be strained by a unidirectional field to many times its polarisation value in an alternating field, and, once polarised, it behaves as if its molecules were dipoles.

Pure distilled water with a resistivity of 70,000 megohms per cm. cube is a better insulator even than celluloid. Yet in oils that are insoluble in water the smallest quantities reduce the breakdown strength in a remarkable manner. This is not necessarily caused by the increase in the electrical conductivity of the mixture, for minute carbonised-cotton fibres in such quantity that the oil is black do not, even with high voltages, cause a disruptive spark to pass. Water particles in an electric field gather to form larger drops, while there is a succession of miniature arcs between the ends of the carbon fibres that are extinguished rapidly by the oil. It is not the conductivity of the water or its solvent power that makes it dangerous, but its very high dielectric constant.

Plastic Insulation

Many of the phenomena of conduction in cable insulation suggest that endosmose plays a large part in it. Mixing the compound with inert colloids or carnauba wax, the fine crystals of which act as baffles to any movement of fluid, lowers the conduction current to a small fraction of its previous value. Ionisation by collision in air cavities or films cannot on the evidence be responsible for so great and uniform a change as that observed. Whatever happens must be looked for in the compound itself and in any charge its particles may acquire.

The real function of insulation is to transmit energy, for by it alone and not by the wire it covers is the energy of a circuit carried. It is an axiom of mechanics that power is transmitted by the action of a force in a medium causing a strain that is continually relaxing at the point of delivery. In an electric circuit it is the insulation and not the wire that is strained. Poynting's law states that power is transmitted through a dielectric by the combined action of electric and magnetic fields at right angles to one another. In the case of a concentric cable or overhead line the electric field is radially outwards from the conductor; the circular magnetic field is coaxial with it. The energy transmitted streams through the insulation parallel to the conductor.

How a Motor is Driven

In the case of an electric motor, the energy passes from the insulation of the line to that around the conductors of the winding, to the core, and so to the shaft. It must therefore pass outwards, away from the conductor. The magnetic field around the current is at right angles to the conductor, and, in order that the energy flow should also be at right angles to the conductor, and outwards, the electric field must be along the insulation parallel to the conductor, in the opposite direction to the flow of the current and therefore in the same direction as the induced voltage in the conductors. So that the motor is driven mechanically not by the voltage generated in the copper of the windings (that merely holds up the line voltage and controls the current), but by the voltage generated in the insulation surrounding the conductors by its own motion across the pole flux.

Apart from some polarisation there is the same voltage induced in the insulation as there is in the conductors, but by virtue of its being a non-conductor only an infinitesimal conduction current flows along it, though energy streams through it freely. The flow of energy is not symmetrical from the wire to the core, for the magnetic field is distorted. There is therefore a difference in the rates of flow of energy on the two sides of the conductor, and more flows from the side carrying the greater magnetic field. The direction of flow of energy into the core is therefore opposite to the direction of rotation of the armature, as it should be, and as it is in the case of a pulley driven by a belt. What actually changes is the state of strain in the belt between it and the molecules of the pulley. Without such a strain no energy could be transmitted.

In the Wake of the Grid

SINCE the establishment of the grid load development had become a responsibility which must be shared by all sections of the industry, said Mr. L. E. Mold in his address as chairman of the North-Eastern Centre of the INSTITUTION OF ELECTRICAL ENGINEERS at Newcastle-on-Tyne on October 22nd.

It could not be left to supply authorities alone. Manufacturers must continue their efforts to provide load-consuming devices which would attract consumers and save them expense. There was much scope for economy in the sale of domestic appliances, particularly the larger kinds, for in many cases the cost of manufacture was low, but the price to the user was inordinately high on account of cumbersome selling methods.

The development of water-heating was progressing rapidly, and a large potential demand for power seemed within reach through the advent of the electrode water-heater and steam raiser, particularly when applied during off-peak periods for heat-storage. Under proper conditions, capital costs, interest charges, depreciation and maintenance were all on a competitive basis with other methods.

Considerable novelty in switchgear design, particularly for use at 33 kV and above, was being displayed to meet the requirements of economy and ease in maintenance. Such units were inherently large, and it was frequently too costly in the initial stages of development to provide alternative feeds, so that when it was required to carry out maintenance work on those parts of the gear which could not be completely isolated it became necessary to shut down the supply to enable the work to be done in safety. One solution of this difficulty was to construct the bus-bars in the form of a closed ring with section isolators so disposed and interlocked that all the apparatus associated with any circuit, including the bus-bar section, could be completely isolated and solidly earthed. This construction might be described as a "detachable bus-section panel-unit."

A multitude of switchgear designs were being marketed for sub-station service at 11 kV and below. Many recent designs ignored the essential factors of security in service, and it was regrettable to witness the return of air-insulated equipment in place of solid compound or oil-filled gear.

There were possibilities of improvement in diversity factor and easement of peak loads by the independent control of heating loads both for room-warming and for water-heating. A proposal of Mr. Swingler, city electrical engineer of Cape Town, was to automatically switch the water-heating load in such a way as to level the total load on the installation, so

The office in the all-electric ensemble at the Exhibition of Contemporary Industrial Design (left) and some of the electrical equipment in the kitchen (See page 602)

that the diversity factor of the network would be improved without serious inconvenience to consumers, to whom indeed some benefit could be given under the scheme by means of a suitable tariff.

The performance and rating of circuit-breakers, both old and new, presented an acute problem which had been much accentuated in Great Britain since the institution of the grid. Thanks to the Hebburn short-circuit test-plant, reliable data, previously unavailable, were now to hand and great advances in the art had been made. Now that test facilities existed in this country one looked forward to a new edition of the B.S. specification in more complete form embodying conditions of test severity.

The stress to which a circuit-breaker enclosure might be subject was due to the impulse pressures established by gas generation during the process of bringing about arc-extinction. The rate of rise of re-striking voltage was a predominant factor in stress, because, when it was high, the arc was likely to be re-established for a greater number of half-cycles with consequent increase in arc-energy and gas-generation. The re-striking voltage was a transient phenomenon which appeared across the arcing contacts at each zero pause as a high-frequency oscillation, due to resonance according to the inductance and capacitance in the circuit. For a given kVA broken, the stresses in a circuit-breaker might vary in ratio as much as three to one according to the circuit characteristics.

Mr. Mold endeavoured to show the advantage of using known values of voltage and current, *e.g.*, the normal-voltage and the a.c. component of current, in calculating an assigned kVA; and to deal with the associated variable functions of recovery voltage and d.c. component of the current only as factors of severity in calculating kVA performance. The meaning of a kVA breaking capacity rating would depend upon the conditions of test severity under which a circuit-breaker had been proved and the method of calculating the assigned rating from such performance. The power-factor of the fault-current could have appreciable bearing upon the performance of a circuit-breaker and therefore should be treated as one of the factors in severity of the test circuit.

It was most important that the conditions of severity should be defined and standardised. A great deal of work had already been done and a method due to Mr. B. H. Leeson and Mr. J. A. Harle was worthy of their utmost support. The objective in preparing a universal specification governing the rating and performance of circuit-breakers under short-circuit conditions was to enable comparison in test results to be obtained when the tests were made with plant having different characteristics.

High-voltage Cables

THE trend in high-voltage cable technique as set out in a paper by Dr. P. Dunsheath (to which reference was made in April last when it was presented at Manchester) was discussed by the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on October 22nd.

Mr. J. R. Cowie said he was not quite clear how the author constructed the spiral spacer in the gas cushion cable, and whether he had taken account of variations in frequency.

The author replied that change of frequency was an unnatural condition. Frequency did not change when the cable was in use so that it would be difficult to correlate the facts for service conditions. The gas pressure depended upon the size of the cable, temperature, &c., but it was possible to design these cables with varying forms of pressure/temperature curves.

The Retention of Pressure

In answer to Mr. H. J. Wadman, Dr. Dunsheath said that if a pick seriously damaged a cable it would fail electrically, but the gas pressure would not fall because of the high pneumatic resistance everywhere along the line. The pressure only dropped at the particular point of damage; a few yards on either side it was fully maintained even when the cable broke down electrically.

Mr. G. M. S. Sichel said he doubted whether cables could be operated so that they were not subjected to sudden changes of temperature. It had been shown by means of oscillograms that at the moment of opening an oil switch, frequencies of the order of 60,000 per second were produced and superimposed on the normal frequency wave. What would be the effect of that on the gas cushion cable? The author replied that if the dielectric were heated and cooled slowly the compound could get gradually back through the laminated paper, whereas if the cable were heated and cooled rapidly the tendency would be for the compound in the outer layers to be more viscous and there would be a greater liability to trouble. The viscosity and surface tension of the compound played an important part. One patent specification made provision for arranging the individual conductors in such a manner as to maintain a reasonably constant temperature. The highest voltage cables in actual use at the present time were 132,000-V oil-filled cables which had been operating very satisfactorily for five or six years. Experimental work had been done with 200,000-V cables.

Mr. E. A. Deacon was informed that a low insulation resistance at a hot joint was not evidence of moisture being present. Whether carriers of electricity influenced by a rise of temperature were impurities in an otherwise apparently dry compound or whether they were due to moisture, the operation was precisely the same. It was all a question of increasing conduction due to temperature. Mr. W. J. Jeffrey was told that the pressure in the gas cable was of the order of 100 lb. per sq. in. It was possible to work at 500 lb., according to the physical properties of the sealing compound. No gas cable had yet been laid anywhere, except at Walthamstow, on a commercial scale. Replying to Mr. Watson the author said that generally the gas pressure cable would give the best financial advantages at 60,000 V.

The Mount Royal Flats

THE large block of 647 residential service flats known as Mount Royal, which has grown up within twelve months at the Marble Arch end of Oxford Street, is designed to accommodate 1,200 tenants and give them the advantages of full hotel service.

A series of public rooms, such as a spacious lounge, restaurant, bars, shops, toilet establishments, resident doctor and dentist, and even a promenade roof garden, make the building quite self-contained and enable the residents to obtain all the necessities and many of the luxuries of everyday life without leaving the premises.

Decorated and furnished in modern style, the flats consist either of two separate rooms or a single combined bed-living room, each with a bathroom, small kitchenette, and tiny entrance lobby opening on to corridors.

Detail planning and standardised construction have enabled Holland & Hannen and Cubitts, Ltd., to carry out the building work almost twice as fast as recent similar contracts. This firm has also carried out the electrical installation contract. About 7,000 Siemens electric lamps have been supplied, together with 5,000 Falk, Stadelmann lighting fittings and Bective standard lamps. Besides general lighting points, each flat has two spare plug outlets and a P.O. telephone. In each kitchenette there is a Pressed Steel Co.'s small combined refrigerator and electric cooker with fan ventilation to minimise cooking odours.

The electric wiring, fuses, meters, &c., are concealed behind casing at the top of the corridor walls, which makes it unnecessary to enter the flats for repairs and meter-reading. Groups of sixteen flats are served from local bus boxes, or switching cupboards on each floor, while the corridor illumination is similarly controlled remotely with Igranic clapper switches by the floor housekeepers. These floor distributors are fed by group ring mains rising from circuit-dividing busbars controlled by 100-A metal-clad Foster switches in the basement. The 415-V three-phase and neutral main incoming supply, controlled by 1,000-A G.E.C. oil circuit-breakers, is derived from a Marylebone Corporation step-down transformer sub-station housed on the premises.

Power and lighting circuits form independent groups, while G.E.C. automatic contactor change-over gear has been installed to maintain, through alternative feeder sources, emergency lighting circuits in main corridors and similar situations. B.I. and Macintosh cables have been used with G.E.C. conduit and accessory fittings.

The housemaids' signals and fire alarm system were supplied by Julius Sax & Co., and about 150 Synchronome clocks are provided in the various public rooms, main corridors, &c. Besides the G.P.O. instruments, "Reliance" and "Phœnix" intercommunicating service telephones are installed. In addition to four gearless Waygood-Otis passenger lifts, there is an invalids' lift and several others for goods and service use, apart from garbage hoists.

Igranic starters are used for the Crompton Parkinson motors employed in the heating, ventilating, water and sanitary services, assisted by an electrical control signalling system, which is both audible and visible.

Illustrations of the flats appear on the opposite page.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Electric or Diesel?

For several years past the electric locomotive has held its own ground without a rival for its superiority of performance in traction, particularly for local congested services, and on that account heavy commitments have been made in practically all countries for part electrification of their systems, where present heavy traffic conditions justify its introduction.

The performance of Union Pacific Railroad's new streamlined train M1001 with its Diesel engine outrivals the electric locomotive in several respects. I had the pleasure recently of witnessing the performance of one of these Diesel engine cars under trial in Hungary, and its smooth and fast acceleration and performance proved far beyond my expectations and convinced me that it may prove a serious rival to the electric locomotive, but whether in the near future it will be capable of competing and outclassing the electric service is a question that time alone will solve.

But whatever its possibilities, it is a challenge to its rival, the electric locomotive, which the electrical engineer cannot lightly ignore. A. R. NISSAR.

Cologne, Germany, *October 27th.*

Engineers and Trade Questions

There is such a real need to-day for a better understanding of economic principles on the part of technicians and others that one hesitates to pour cold water on the praiseworthy attempts of study groups to bring economics into the realm of practical politics, but "Business Man" sounds a warning note in your current issue when he says that there is no justification for members of such groups imagining that their newly acquired knowledge will enable them to dispense with the business man.

Economics has not always been a popular study. To-day's world conditions have forced its attention on us, but its study may be attended by some measure of danger unless it is undertaken under skilled guidance. Unfortunately, the reading of a few books and indulgence in round-table talks sometimes conveys a sense of superiority, and those good people whose flights into the economic blue are made on the wings of theory soon find that they crumple up on an encounter with the force of facts.

The subject in the graduate class examination of the I.E.E. to which "Business Man" refers is not so much a matter of "economics" as it is an outline study of the principles underlying the practice of modern industrial administration. The word "economics" perhaps sounds better and is a little more highbrow, but a study of the syllabus on which the questions for this part of the examination is set will show that there is more in it than just "economics."

Young engineers should heed "Business Man's" words lest the "economic" bug bite them too severely. What they really need to study are the fundamentals of business management or industrial administration, whichever term is preferred, a different thing altogether from economics, and they will find it taught under proper guidance as a specific subject in many polytechnics and colleges. H. N. MUNRO.

London, S.W.1, *October 26th.*

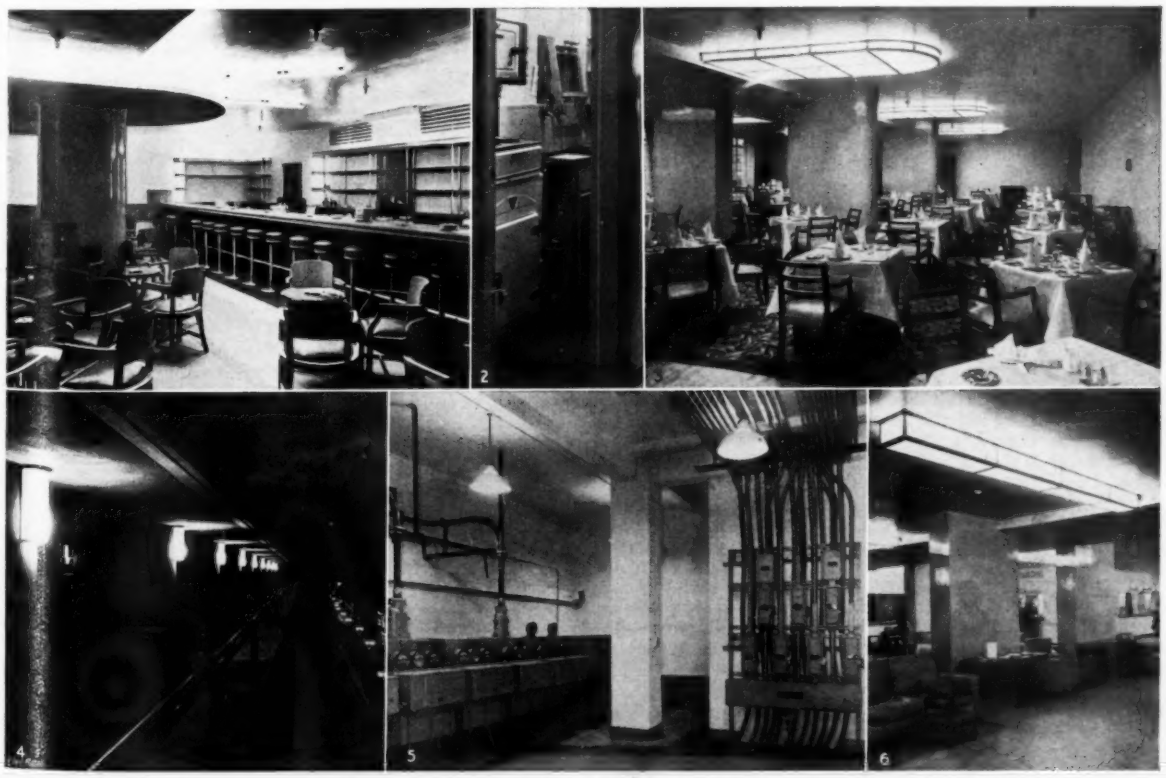
The I.E.E. Regulations

Being very interested in earth-leakage matters, and especially in the development of suitable switches for earth-leakage protection, I have read Mr. A. G. Bullen's letter with attention. I should be grateful if he would give a few particulars concerning the switch that he has developed, which are not apparent from his letter.

Presumably his switch can only be operated in areas where earth resistances are comparatively low, as with an operating current of one ampere every ohm in the earth resistance means another volt on the conduit before isolation. This is the reason for the low operating current mentioned in Rule 1,005C, for with ordinary earth plates and tubes a resistance of from 50 to 100 ohms is common. Mr. Bullen also states that his switch is single-pole; this, again, would not suit the rural installation, where it is necessary to disconnect the neutral as well as the phase line.

Whence did Mr. Bullen obtain the figure of 1.5 W as being necessary to operate a switch? Surely this depends entirely upon the mechanism of the switch, and I have recently examined some earth-leakage switches of 200 A capacity, four-pole, for either d.c. or a.c., that are operated with an energy expenditure of 0.3 W. There are many such switches in use for capacities up to 30 A that can be operated with 0.1 W and lower. His remarks concerning high potential upon conduits with 30 mA switches, therefore, concern his own switch only, and are not common to the generally accepted form of earth-leakage switch.

Again, Mr. Bullen's idea of a thermally operated earth-leakage switch seems to me to be wrong in principle, as the inherent time-lag of such devices prevents efficient operation.



The Mount Royal Flats. (See opposite page.)

1. The cocktail bar. 2. A glimpse into one of the kitchenettes, showing combined refrigerator and cooker. 3. The restaurant. 4. The top floor promenade at night. 5. Part of the supply arrangements. 6. The entrance lounge.

Take the case of an earth plate offering 100 ohms resistance to the earth current, then with an operating current of one ampere a considerable amount of energy in the form of heat is produced in the plate. In practice, it is usually found that earth currents pass over a very small portion of the surface of a plate, and if the whole ampere has to be carried by a few square inches in contact with conductive earth then considerable heating will take place with consequent drying of the soil. This will cause an increase in resistance and the isolation of the faulty circuit will be further off than ever.

Also, the duration of shock determines whether it shall be fatal or merely unpleasant, and nothing but the most rapid magnetic trip can possibly ensure that disconnection is immediate and certain in the case of leakage potentials. All these factors point to the necessity of the limitation of leakage currents to a low value, and the 30 mA mentioned in the Regulations is low enough for safety whilst providing ample energy for operating the trip without high potentials.

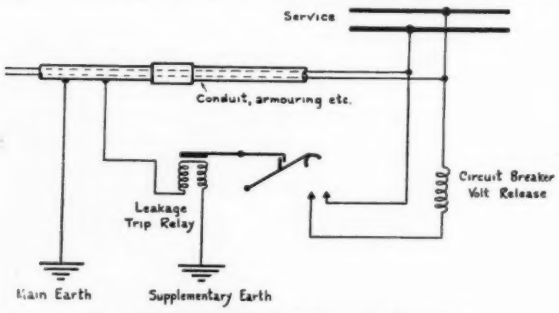
There is no reason why earth-leakage switches should not be connected between conduit and neutral wire, but has Mr. Bullen considered the possibility of a potential upon the neutral —due to unbalanced loads—operating the switch by passing a current to the conduit, or alternatively, placing a potential upon the conduit?

Mr. Bullen will forgive my references to rural installations, but it is clear that the Regulations visualise such installations when the figure of one ohm earthing resistance is mentioned, as in no other area is it likely that this value will be even approached. It is only in the event of high earthing resistance that earth-leakage switches are compulsorily required by the Regulations, and with good reason.

Folkestone, *October 27th.* T. C. Gilbert.

In a letter published in your issue of October 26th, Mr. A. G. Bullen makes the interesting suggestion of providing a thermal-release earth-fault circuit-breaker, but since the device requires a current of 1 A to operate it, it can hardly be described as a "leakage trip."

Mr. Bullen says that as the resistance for the device is 1.3 ohms the drop across it when carrying 1 A would be less than 2 V, but unfortunately it does not by any means follow that the voltage of the conduit, and other "earthed" metal to which the device is connected, will be prevented from rising to a very high voltage above earth. This voltage depends,



A parallel pattern earth leakage trip relay

in fact, entirely upon the resistance of the supplementary earth to which it is connected; Mr. Bullen does not say what kind of earth he has in mind. It would clearly be useless to connect it to the main earth, and since it is only in case the latter has an abnormally high resistance that Regulation 1005C applies, the resistance of the supplementary earth most certainly cannot be neglected. If it amounts to 100 ohms—by no means an abnormal value for a local earth—all so-called "earthed metal" will rise to over 100 V above earth before operation can occur.

It is evident that it is precisely for this reason that the I.E.E. Regulations stipulate that the current causing the trip device to operate shall not exceed 30 mA, since the voltage drop over the 100-ohm earth plate postulated above would then be only 3 V and even a 500-ohm earth would involve a rise of only 15 V.

Mr. Bullen rightly points out that a direct acting trip coil will probably require at least 1.5 W to operate it, which at 30 mA entails a rise of 50 V (and undoubtedly still more with a.c.). Circuit-breakers have been devised which consume less power than this, but we regard them as far too delicate for ordinary use on consumers' premises. It is for this reason that we always advocate a relay-operated leakage trip, connected as indicated in the accompanying figure.

The relay coil may be incorporated in the circuit-breaker (in which case it adds but little to the cost) or may be separate from it. In either case the impedance of the winding is less than 500 ohms, so that, even in the unlikely event of the earth resistance rising as high as 500 ohms the maximum possible voltage rise is 30 V above earth, a perfectly safe voltage. An advantage of the separate relay is that the installation may, if desired, be divided up into a number of sections of which only the faulty one will be shut down.

Everett, Edgcumbe & Co., Ltd.

London, N.W.9, *October 29th.*

Training Control Engineers

It would be unfair for Mr. Turnbull's advice in your current issue on the training of control engineers to go unchallenged, good as it is in a way. His suggestion that control engineers should have lectures and be trained to meet all and sundry conditions by reproducing these conditions on a model of the systems which they control is, in my opinion, to be avoided, except as a possible aid to get to know the system and allow of experimenting with the system in miniature.

Experience has taught me that planning beforehand every imaginable kind of trouble and methods to deal with it only leads to confusion, because when any disturbance occurs on the system to upset the normal working it never happens according to plan, and the sequence of operations to bring the system back to normal does not fit in and confusion arises. My advice to all control engineers is to adopt the following rules:—

(1) Do not allow your job to become a routine one. Constantly study the system under your control; get to know it so well that you can draw a diagram of the whole system, not from memory alone, but from a complete knowledge of the system in its layout, geography, and technical dispositions. You will then be able to visualise the effect of each operation when switching.

(2) See that your telephone system is sound and reliable, and, knowing this, have confidence in it and any messages or signals you transmit or receive.

(3) Have a good control diagram, either geographical or semi-geographical. In any case it should be a diagram by which you can instantly visualise the system both in layout and conditions as to distances and values.

(4) When trouble occurs keep cool and confident in all your actions and do not attempt to correct the trouble until you know the state of the system. Then go ahead and correct the trouble with confidence and despatch. Nobody can advise you how to do it because your actions are governed by the trouble with which you are dealing.

If I attempted to advise further I would be contradicting what I started out to do, that is, to refute the possibility of a rule-of-thumb method to correct trouble. Of course, it is taken for granted that the control engineer knows all the technical details of his system. B. W. J.

October 29th.

An Armour Clamping Device

The following practical suggestion may interest your readers: I have been running a large quantity of steel-wire-armoured cables and find that starters, main switches and distribution boards are too small to permit the use of the usual type of gland. All that is required is a piece of conduit large enough to take the cable without armour. The conduit is threaded to a length sufficient to take two locknuts and a bush. The surface is thoroughly cleaned to ensure a good earth connection. The armouring is bound off as usual and the wires cleaned.

A clip made from light-gauge sheet iron with two bolt holes is clipped over the armour which is splayed round the conduit. A small filling piece of sheet iron is inserted in the space between the bolts and the armour to fill up the gap. When the bolts are fully tightened a good rigid connection is made. The clips are simple to make from scrap sheet iron.

I have used this method satisfactorily for several years now, as the clips and tubes cost very little in comparison with a gland. Burced.

October 26th.

Standard Switch-plugs

Noting the remarks in your issue of October 19th regarding switch-plugs, we would like to mention that during the last twelve years we have made various sizes and patterns of switch plugs.

We must say that there has never been a definite policy among the various Corporations and it is certainly time that a standard type was adopted. Now the new standards are available and there are a number of firms making to Specification, it is the duty of Corporations throughout the country to use standard switch-plugs. By this means costs will be reduced, time will be saved, and the stocks of the Corporations, wholesalers and contractors will be considerably reduced.

Electrical Appliances (Blackpool), Ltd.

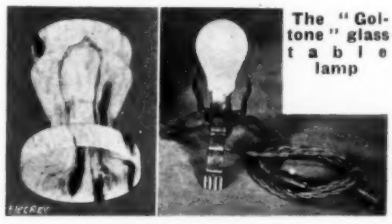
Preston, *October 25th.* W. T. Rawcliffe.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Bakelite Accessories

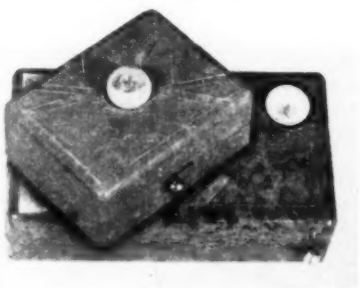
MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester, have introduced a translucent glassware table lamp with a bakelite base. Six shapes are available, and the specially designed stand which holds the lamp fits inside the glass. The price (7s. 6d.) includes the stand, cord, torpedo switch, lampholder and adaptor. The same type of bakelite stand, with the addition of a column, is available for standard type shades. The price is 6s. 3d. with a switch-lampholder and flex but excluding the shade. During the examination of these new products we saw also a new range of small bakelite flashlamps priced at 1s. 6d. They are worked off 3 V batteries and are available in various colours and sizes; an illustration of these appears below. A special catch is provided to prevent the switch working "on." A further item is a bakelite trickle charger for 200/250 V, 50 cycles, which is suitable for 2, 4 or 6 V accumulators.



The "Goltone" glass table lamp

An Infra-red Lamp

The new "Grosvenor" infra-red lamp which has been marketed recently has several refinements, including a new system of positive fixing of the angle of the reflector. The unit cannot slip once the angle has been fixed, for the main movements do not rely on friction grips, but on positive pins that slip with spring action into fixing holes. The element is of the black-body flat-plate type measuring 12 in. by 4¼ in. and rated at approximately 800 W. Owing to the shape of the reflector it gives an even beam of rays to cover a large area, the outfit being specially designed for lumbar, spinal column and limb work. The unit is retailed at £15 15s.



Two new "Goltone" bakelite pocket lamps

An Electrically-heated Chick Brooder

The "Visi-Sunray" chick brooder is designed on similar lines to the standard "Visi" brooder, but incorporates a thermostatically controlled electric heating unit instead of an oil lamp. The "Satchwell" thermostat enables a constant temperature of from 60 to 100 deg. F. to be maintained by setting the dial at the predetermined temperature. A small pilot light, which indicates that everything is working properly, also serves to guide back to the warmth any chicks which may stray from the brooder. Model No. 2 (size 30 in. by 30 in.; price £3 17s. 6d.) has a "Brightray" nichrome element rated at 350 W. It will raise the temperature to 100 deg. F. in thirty minutes, although the running consumption is claimed to be less than one kWh in eight hours. As the heater is suspended from the top the whole of the floor space is available for the chicks, various sizes of brooder being available from 2 ft. to 3 ft. 6 in. square. Both a.c. and d.c. models can be supplied. Among the non-electrical features are the almost fool-proof ventilation and an easily detachable inspection window which makes it unnecessary to open the top of the brooder at frequent intervals. Specially woven, non-frayable curtains are provided. These are divided so that each side can be drawn apart to allow for the unhampered exit and entrance of chicks. Three metal shutters are provided which may be hung either inside or outside the brooder.

The "Visi-Sunray" electric brooder

A Four-heat 2-kW Fire

Flexibility of control is the feature of the new "Brightglow-Super" 2-kW fire, as, by means of two foot-operated switches, it is possible to obtain loadings of ½, 1, 1½ or 2 kW. The fire, which can be obtained for 30s. in several lacquer finishes and 55s. in stainless steel, measures 16 in. high, 12½ in. wide, 8½ in. deep, and weighs 11¼ lbs. A cheaper two-heat version of the same fire is also available from BRIGHTGLOW, LTD., Oaklands Road, Cricklewood, London, N.W.2; it is fitted with a central foot-operated switch.

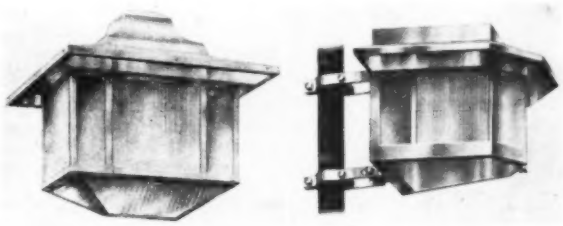
The "Brightglow" two-heat model

Heat Insulation

A heat insulator composed of diatomite and precipitated or calcined products forming a crystalline powder of a fineness exceeding 100 to 150 mesh into which is blown well-fused long-fibre asbestos, has been placed on the market under the name of "Thermolag." The claims advanced for this compound are low heat conductivity, little cracking on drying out, adhesive power, low heat absorption within the material, resistance to moisture and absence of tendency to calcine at high temperatures. Two grades are available, one for temperatures up to 250 deg. F., the other for temperatures up to 1,250 deg. F. National Physical Laboratory reports indicate the attainment of efficiencies (saving of pipe loss) of 81 per cent. at 350 deg. in the first case and 94 per cent. at 1,100 deg. in the second, the figures for the loss of heat per sq. ft. (corrected for an air temperature of 20 deg. F.) being, respectively, 162 and 663 B.th.u. per hour. The manufacturers are THERMOLAG PRODUCTS, LTD., Eagle House, Jermyn St., S.W.1.

"Escura" Lighting Equipment

The "New Enfield" lantern has been designed by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2, for the efficient illumination of streets where central suspension is desirable, but by adjustment of the optical elements it is equally applicable to side mounting on tubular brackets, and for replacing old type lanterns in existing installations in which there are suitable poles and brackets.



The Ediswan "New Enfield" and "Hertford" lanterns

In the horizontal plane specially designed refractor plates placed in the faces of the lantern at right angles to the road, concentrate the greater portion of the light and redirect it up and down the street. The remaining rays, which would normally be thrown on the buildings on either side of the street, are similarly redirected by opal reflectors inside the lantern. The prismatic glass, with which the bottom door is glazed, controls a portion of the downward light, partly diffusing it on the area in close proximity to the unit, partly redirecting it up and down the road. Horizontal silvered glass reflectors are provided outside the lantern to throw on to the road surface light which would otherwise go upwards and be wasted.

A special feature incorporated in the design is a means for the ready adjustment on site of the beam in the horizontal plane so as to ensure that the light is delivered in correct relation to the direction of the road on curves and bends. For this purpose, the Goliath screw lampholder, which is of the heavy all-porcelain type, is adjustably mounted on a cross traverse calibrated in degrees. When desired the equipment can be so arranged that more light is delivered in the direction of traffic movement.

The top canopy of the lantern is an "MVC" light alloy casting and is provided with a door for access to the lampholder for wiring and adjustment. The remainder of the lantern is built up from heavy gauge copper. The whole of the bottom is a hinged door giving easy access to the interior for lamp renewal and cleaning. All the outer glasses which are

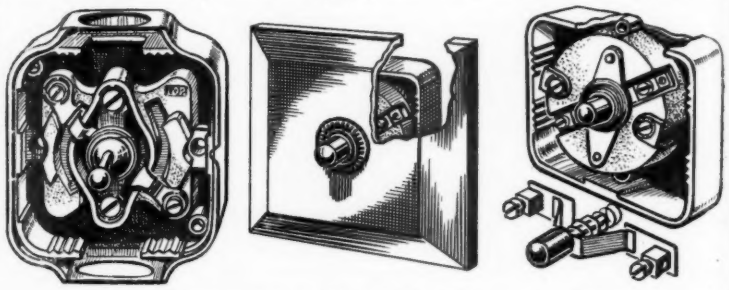
cemented in, have smooth outer surfaces. The "Hertford" lantern (improved model) has been designed for the efficient illumination of streets where side mounting is desirable, and is particularly suited for mounting on existing tramway standards. The light control is such that the maximum amount of light is thrown in the direction of the traffic movement with a lesser intensity in the direction of the oncoming traffic, but, by adjustment the intensity can be equalised.

Flush-fitting Switches and Bell Pushes

The "Tenbyluxe" switch, which has already been described, in these columns, is now made in a special form for fixing into a metal casing, which is supplied by the makers, MESSRS. S. O. BOWKER, LTD., 20, Branston Street, Birmingham, with the switch. The casing is shaped to take the bakelite interior and can be fixed into a wall by the builder when the plastering is done, the electrical contractor inserting the appropriate switches and bell pushes later on.

The switch is only $\frac{7}{8}$ in. deep and knock-outs are provided at top and bottom. The insulated arc channels give a high breaking capacity and a special protected fibre washer insulates the movement from the blade.

A new bell-push made by the company (and illustrated herewith) has special self-cleaning contacts.



The metal-cased "Tenbyluxe" switch, showing the metal casing, and a bell push, with self-cleaning contacts

Sterilized Telephone Mouthpieces

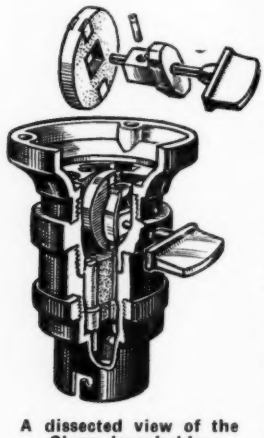
We recently examined a new sterilized telephone mouthpiece for fitting to standard G.P.O. telephones. There are two parts, which conceal a cavity filled with "Lysolats," and this, through special breather holes, gives off a sterilising vapour which permeates all parts of the transmitter. When the instrument is in use the breath of the speaker increases the rate of volatilisation. Telehygiene, Ltd., 3, King Street, Covent Garden, London, W.C.2, supplies a newly charged mouthpiece every quarter.

Portable Power Rammers

We regret that the address of Messrs. C. H. Johnson & Sons, Ltd., was incorrectly given in our issue of October 26th. The correct address is Smedley Road, Manchester, 8.

An Unusual Switch Lampholder

The Clang combined switch and lampholder, which we have recently examined, has an unusual switching arrangement inasmuch as it is of the rotary type (as shown in our accompanying sketch) operated by a wing type handle on the side of the body. In other respects the lampholder follows standard practice, being made in bakelite and available with a shade ring or H.O. skirt. It is made by CLANG, LTD., Crown Yard, Cricklewood, N.W.10.



A dissected view of the Clang lampholder

Power-factor Correction

MESSRS. CROMPTON PARKINSON, LTD., Bush House, W.C.2, have placed on the market a new phase advancer to supplement the work of their auto-synchronous motors in power factor correction. The machine can be belt driven from the main motor, from countershafting, or by a small motor, and in mechanical design is very similar to a standard Crompton d.c. motor. It is connected to the slip rings of the main induction motor, and the voltages generated in its armature cause an advancement in phase of the rotor currents of the main machine and thus an advancement of its stator currents. In this way the main motor can be made to operate at unity or leading power factor.

The motor is started in the ordinary way and when up to speed a change-over switch is operated and power factor improvement takes place automatically without separate adjustment. Should it be required to vary the leading kVA from time to time, an ordinary hand regulator operating on the windings of the phase advancer can be supplied.

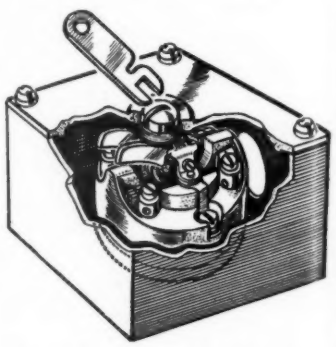
The phase advancer may be applied to new machines, and under certain conditions to existing motors. Its use with an existing induction motor will considerably increase the momentary overload capacity and in certain instances will raise the efficiency of the combined unit (fig. 2). The motor with phase advancer will adjust itself instantaneously to changes in load and is not affected by normal speed variations due to load. It is thus particularly useful for duties such as rolling mills, winders, hoists, drop stamps, and extrusion and drop presses.

Since the load on the motor fitted with a phase advancer may bear little or no relation to the total load on the factory the degree of correction should be substantially independent of the power output of the machine and this feature, as the characteristic curve illustrates, is readily obtainable.

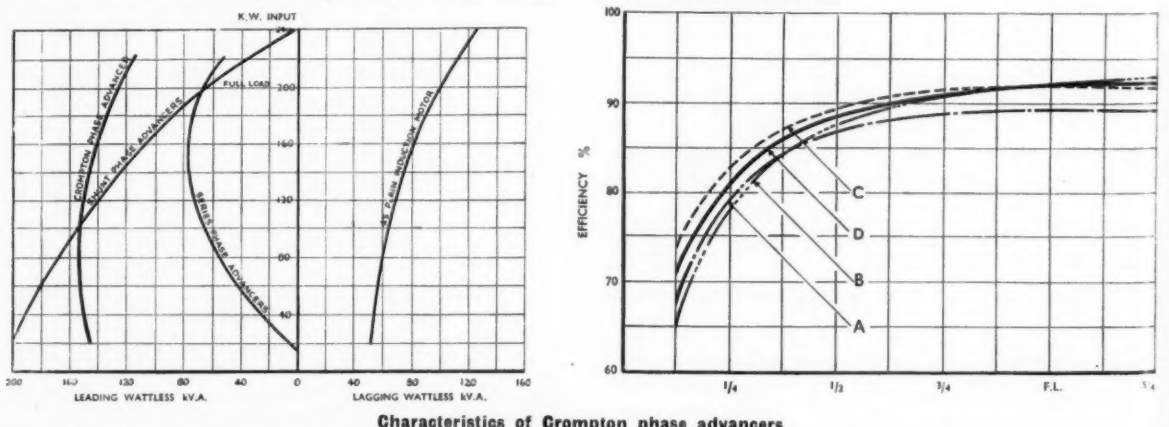
A Key-operated D.p. Tumbler Switch

A double-pole tumbler switch for the control of neon lighting and employing key operation is the latest addition to the range of switches made by MESSRS. A. P. LUNDBERG & SONS, LTD., 477-489, Liverpool Road, Holloway, London, N. This switch meets the requirement of I.E.E. Regulation No. 145 for neon sign installations, as the steel operating key can only be removed when the switch is "off," the position being clearly marked on the polished brass cover or cast iron lid.

In the surface and semi-recessed patterns the switch cover is locked in position with a polished brass ring fixed by a special key, while with the ironclad pattern, the lid can only be removed by unlocking the fixing screws with the operating key of the switch, provision also being made for sealing the lid in position. The ironclad model illustrated has a cast-iron box and lid, and various sizes and types of 5 A and 20 A models, rated 250 V, are listed, including surface, semi-recessed and flush models.



A sketch of the "Lektrik" neon sign switch



Characteristics of Crompton phase advancers

The two left-hand graphs indicate the comparative characteristic curves of series, shunt and Crompton phase advancers; in the performance curve on the right A represents an induction motor, B an auto-synchronous motor with constant excitation, C a similar motor with automatic compounding, and D an induction motor with a Crompton phase advancer.

Wiring of Tenanted Property. By R. D. Reynolds, A.M.I.E.E.

A FREQUENTLY referred to topic, which invariably excites interest and comment at electrical functions, is that of the unwired homes of Britain. The latest figures show, I believe, that approximately 4¼ million out of about 10¼ million homes are wired, which leaves the wiring of 5¾ million homes as potential business. If we average each installation at the low figure of £5 there is £28,750,000 worth of business to be picked up. Unfortunately there are many obstacles in the way, one of the chief ones being the rented house.

During the past few years of comparatively high rates of interest on War Loan and other gilt-edged securities, the funds of the capitalist have been diverted from property ownership, and large numbers of people have purchased or built houses for their own occupation. Coincident with a lowering of interest rates on sound securities, property is again being looked upon as a sound investment for renting purposes, so that the tenant class is once more increasing.

Mr. R. D. Reynolds

The difficulty of getting the tenant occupier to become a consumer of electricity is no new one. An impasse usually develops because the landlord spends the minimum possible on his property, and the tenant takes the view that as the landlord will not spend money on necessary repairs, he (the tenant) is not prepared to go to any expense in improving the property. This situation has led to many different assisted wiring schemes being devised.

Many consumers have been obtained by the operation of these assisted wiring schemes, and it can be said that without such schemes, operated by a third party, neither tenants nor landlords would have been induced, no matter how much money had been spent on publicity, to wire some of the houses now connected to the mains. It is, however, also true to say that the landlords of many of the houses connected under assisted wiring schemes financed by the electrical industry could, by proper handling, have been persuaded to provide the necessary capital themselves.

Approaching the Landlord—

An electrical installation is not by its very nature a tenant's or other party's fitting or fixture that can be easily removed. It becomes as much part and parcel of the structure as the water system. Obvious complications, particularly when changes of tenancy occur, are therefore avoided when the wiring is carried out by the landlord.

If we approach a landlord with a suggestion that he should wire his property, a refusal is generally the result, simply because he fails to see any personal gain in doing so. If he has difficulty in letting his property, he may wire it to make it more attractive. But if he can obtain a certain return on money laid out in wiring, the proposition takes on the character of an investment and is viewed quite differently.

I am convinced that if landlords are tackled in the right way, by either wiring contractors or supply authorities, a very large number of them can be persuaded to wire their property. Personal approach is necessary. In the first instance, after the advantages of electrification have been thoroughly explained, the direct question should be asked: "Are you prepared to wire your property?" Upon a refusal being met with, it is a sound plan to suggest that the landlord, as a good business man, naturally feels that some return on capital laid out should be obtained, and the next step is to suggest schemes whereby the wiring of the property can become an investment. If the man has any spare capital, you should, in modern sales jargon, succeed in "selling him the idea."

In the days of 5 per cent. War Loan the writer suggested to a retired builder, who owned a lot of property, and who had refused to wire it, that he should do so if his tenants would pay 5 per cent. interest on the money so expended. He agreed to spend £10 on wiring each house and no difficulty was experienced in getting the tenants to agree to pay an extra 10s. per annum for the wiring; the result was that a considerable number of new consumers were obtained.

In another case, a land and property owner was anxious to have the supply extended to his farms. None of the tenants would wire; he was therefore asked to agree to bear the cost of wiring. This he could not, as usual, see his way to do. On being asked under what arrangements he carried out improvements to his property as distinct from repairs, he said that he charged the tenant 5 per cent. on the money spent. The obvious answer was to suggest that he should carry out wiring under the same terms, to which he agreed.

A firm of manufacturers agreed to wire a large number of cottages which they owned, provided some return on capital could be obtained. They wired the dwellings on the following scale: Up to 3 lights, 1d. per week; 4 to 6 lights, 2d. per week; 7 to 9 lights, 3d. per week. They are quite satisfied with the terms and so are the tenants. Another scheme which a number of property owners have been induced to adopt, has as its basis a charge to the tenant of ½d. per light or per 5-A plug point per week with a minimum of three points. A charge of ½d. per light per week represents a return to the landlord of over 10 per cent. on capital, if he spends as much as 20s. per light.

—and the Tenant

There is rarely much good feeling between the private landlord and the tenant of small property; they generally regard one another with a certain amount of distrust. It is important, therefore, that the contractors or supply authority's representative shall approach the tenant and explain that the scheme has been suggested to the landlord and he has been persuaded to agree to wire his houses, provided the tenant will pay one halfpenny per week per light. The most likely "prospect" should be approached first, and when he has been won over, the rest generally follow.

Apart from house property privately and company owned, there are a great many houses owned by local authorities, who will often undertake to wire, provided a demand can be shown to exist, and provided the tenants will agree to some small addition to the weekly rent. When interest has been aroused and suggestions made as to how a scheme should be arranged, the council's clerk will have no difficulty in devising a scheme to suit their financial system of working. Examples of such schemes are as follows:—

A certain rural district council makes a charge of 6d. per week in respect of old houses built under the 1919 scheme; of this amount 3d. is a charge in respect of lamps and shades provided by the authority. When the lamps and shades have been paid for, this portion of the charge ceases. In the event of a change of tenancy, the arrangement which operates is that the outgoing tenant is refunded the amount paid by him in respect of the lamps and shades, less any deductions for breakages, etc., and the incoming tenant takes over the liability, which in this case is met by a lump sum payment and not by weekly instalments. The usual number of lights provided is eight.

Another local authority makes a charge of 6d. per week in respect of old houses until the capital cost of the installation is paid for. No amount is included for interest, depreciation or maintenance, which is provided for out of the council's repairs deposit fund. The number of lights provided is eight and the tenant supplies the lamps and shades.

Finance Schemes

It may not be generally known that loans for the development and permanent improvement—in which is included electrical installations—of farms and landed estates, can be obtained, subject to approval by the Ministry of Agriculture and Fisheries, from the Lands Improvement Co., 58, Victoria Street, Westminster, S.W. Loans are advanced at the favourable rate of interest of 3¼ per cent. and repaid by way of annuity spread over a period not exceeding forty years. For electrical installations the period of loans is twenty years and the annual payment per £100 is £6 16s. 10d. Much electrical development in rural areas might well be helped forward under the scheme.

Certain financial trusts are at the present time operating assisted wiring schemes and their schemes in many cases prove very useful in enabling property to be wired, the real object being, of course, the investment of capital at a good rate of interest, and as there are other charges to be met, including the cost of collecting instalments, they naturally cannot offer terms so favourable to the consumer as the examples given, of terms under which landlords are prepared to wire. Owing to the attendant charges, supply authorities are also unable to make their assisted wiring schemes so advantageous to the consumer. As the lower the repayment charges, the greater the encouragement to purchase apparatus and increase the use of electricity, it becomes obvious from all points of view that everything possible should be done to induce the landlord to wire before a third party is brought in to finance the electrical installation.

American Electrical Exports

PRELIMINARY returns of the electrical export trade of the United States, showing countries of destination, are now available for 1933. From these have been extracted the following figures of the values of the exports of the leading classes of electrical machinery and apparatus in that year to the principal markets, together with a note of the increase or decrease compared with 1932.

The total value of this trade, which fell from $85,373,000 in 1931 to $43,039,000 in 1932, recovered very slightly in 1933, *viz.*, to $43,580,000. Last year the value of exports to the United Kingdom was $2,976,000, against $2,753,000 in 1932; to Canada, $5,264,000 against $7,369,000; to India, $1,540,000 against $1,306,000; to Australia, $1,280,000 against $904,000; to New Zealand, $556,000 against $533,000, and to South Africa, $2,713,000 against $1,813,000. The foregoing figures do not include exports of electric cable and wire, which are classified separately by the United States Department of Commerce.

	1933. $(000).	Inc. or Dec. $(000).
Generators, d.c.—		
Total ...	62	− 12
To Canada	3	− 10
„ Mexico	21	+ 13
A.c. under 2,000 kVA—		
Total ...	80	− 80
To Philippine Is.	28	+ 19
2,000 kVA and over—		
Total ...	326	− 364
To Spain	158	− 152
„ India	29	+ 15
Steam turbine generator sets—		
Total ...	746	+ 637
To Argentina	726	+ 726
Accessories and parts for generators—		
Total ...	210	− 350
To Canada	37	− 20
Arc welding sets—		
Total ...	163	− 112
To Mexico	31	+ 5
„ Italy	20	+ 18
Self-contained lighting outfits—		
Total ...	137	+ 22
To Soviet Russia	20	− 8
„ China	15	+ 12
Batteries, 6 and 12-V storage batteries—		
Total ...	745	− 75
To South Africa	102	+ 44
„ Holland	38	+ 30
„ Colombia	28	+ 3
„ India	70	− 32
Other storage batteries—		
Total ...	242	− 8
To Mexico	47	− 14
„ S. Africa	28	+ 3
No. 6 dry-cell batteries—		
Total ...	236	+ 56
To Argentina	34	− 4
„ Newfoundland	19	+ 1
„ Brazil	14	+ 2
Flash-light batteries—		
Total ...	1,552	− 318
To Argentina	102	+ 18
„ Colombia	85	+ 9
„ India	392	+ 82
„ Malaya	173	+ 28
„ China	169	− 191
„ Dutch East Indies	228	− 52
„ Siam	58	—
„ S. Africa	55	− 4
Radio B. and C. batteries (dry)—		
Total ...	172	− 8
To Argentina	68	− 2
„ China	26	+ 6
Other dry and wet primary batteries—		
Total ...	70	− 17
To Canada	37	− 20
Power transformers, 500 kVA and over—		
Total ...	110	− 510
To Spain	81	− 59
Distribution transformers less than 500 kVA—		
Total ...	211	+ 21
To Mexico	45	+ 22
„ Venezuela	26	− 3
Instrument transformers—		
Total ...	50	− 34
To S. Africa	11	+ 6
Other transformers—		
Total ...	115	− 105
To Canada	15	− 50
„ Mexico	15	− 11
„ S. Africa	12	+ 5
Double-current and motor generators, convertors, etc.—		
Total ...	159	− 101
To Holland	29	+ 29
„ Canada	20	− 30
Switchboard panels, except telephone—		
Total ...	137	− 183
To Mexico	35	+ 12
Power switches and circuit-breakers over 10 A—		
Total ...	548	+ 48
To Canada	66	− 84
„ India	225	+ 211
Fuses—		
Total ...	84	+ 4
To Canada	15	− 7
Watt-hour and other measuring meters—		
Total ...	190	− 40
To Mexico	12	+ 4
„ Argentina	84	+ 49
Indicating instruments—		
Total ...	293	+ 33
To United Kingdom	43	+ 13
„ Italy	41	+ 13
„ Canada	60	− 6
Recording instruments—		
Total ...	124	− 36
To France	27	− 40
„ Canada	13	− 34
Other testing apparatus—		
Total ...	388	− 152
To Canada	128	− 83
Lightning arrestors, choke coils, etc.—		
Total ...	310	− 25
To Spain	37	− 3
Motors, ¼ h.p. and under—		
Total ...	404	− 86
To United Kingdom	105	+ 40
„ Argentina	36	+ 6
„ Brazil	25	− 9
Australia	22	+ 7
Motors, over ¼ and under 1 h.p.—		
Total ...	137	− 8
To United Kingdom	23	+ 16
„ Argentina	20	− 4
Stationary motors, 1-200 h.p.—		
Total ...	510	+ 10
To Canada	41	− 25
„ Mexico	76	—
Stationary motors over 200 h.p.—		
Total ...	87	+ 22
To Venezuela	37	+ 37
„ United Kingdom	10	+ 10
Railway motors—		
Total ...	47	− 1
To Spain	32	+ 14
Electric locos., railway—		
Total ...	—	− 790
Elec. locos., mining and industrial—		
Total ...	195	+ 60
To Canada	48	+ 14
„ South Africa	59	+ 31
„ Mozambique	40	+ 6
Electric trucks—		
Total ...	35	+ 10
Starting and controlling equipment for railway and vehicle motors—		
Total ...	96	+ 26
To Brazil	18	+ 13
Spain	17	− 4
Ditto for industrial motors—		
Total ...	403	− 77
To Canada	113	− 72
„ Argentina	49	+ 41
„ Mexico	45	+ 22
Portable electric tools—		
Total ...	400	+ 80
To United Kingdom	102	+ 12
„ France	89	+ 54
Accessories and parts for motors—		
Total ...	676	− 94
To Canada	165	− 69
Household refrigerators—		
Total ...	4,472	+ 112
To France	290	+ 74
„ United Kingdom	404	+ 71
„ S. Africa	933	+ 447
„ Dutch E. Indies	147	+ 45
„ Argentina	203	+ 118
„ Brazil	401	+ 213
„ India	151	+ 37
Commercial refrigerators—		
Total ...	1,130	− 240
To United Kingdom	143	− 26
„ France	173	+ 3
Electric fans—		
Total ...	170	− 53
To Canada	18	− 43
„ Argentina	25	− 1
Incandescent lamps for automobiles, flashlights, etc.—		
Total ...	110	− 10
To India	36	+ 11
„ S. Africa	11	—
Other metal filament lamps—		
Total ...	480	+ 67
To Chile	62	+ 1
Other electric lamps—		
Total ...	36	− 8
To Canada	14	− 4
Household washing machines—		
Total ...	179	− 75
To Canada	48	− 51
Domestic vacuum cleaners—		
Total ...	210	− 167
To Canada	74	− 137
Flat-irons—		
Total ...	91	+ 4
To Argentina	32	− 6
„ Mexico	14	+ 12
Cooking ranges—		
Total ...	155	+ 15
To S. Africa	69	− 4
„ Mexico	29	+ 26
Electric clocks—		
Total ...	78	—
To Canada	12	—
„ Holland	16	—
Electric furnaces, etc.—		
Total ...	166	− 54
X-ray apparatus, etc.—		
Total ...	657	+ 17
To Canada	236	− 4
„ Mexico	57	+ 41
„ Argentina	45	− 11
Radio apparatus, transmitting sets, tubes and parts—		
Total ...	743	+ 83
To Mexico	117	+ 74
„ China	74	+ 25
„ Canada	69	− 16
„ Colombia	88	+ 54
Receiving valves—		
Total ...	2,623	+ 613
To France	511	+ 331
„ Italy	219	− 21
„ Canada	100	+ 48
„ Argentina	498	+ 213
„ Australia	376	− 84
Receiving sets—		
Total ...	9,323	+ 2,003
To Belgium	590	− 30
„ France	730	+ 210
„ Spain	1,726	+ 906
„ United Kingdom	540	+ 170
„ Mexico	694	+ 304
„ Argentina	366	− 14
„ Brazil	693	+ 272
„ S. Africa	750	+ 308
Receiving set components—		
Total ...	2,784	+ 264
To Argentina	719	+ 145
„ Canada	690	− 84
Loud speakers—		
Total ...	238	− 217
To Argentina	114	− 49
Other receiving set accessories—		
Total ...	314	− 26
To Argentina	41	− 6
„ Australia	23	—
„ Canada	34	− 13
Telegraph apparatus—		
Total ...	164	+ 4
To Canada	50	+ 22
„ Mexico	35	+ 32
Telephone instruments—		
Total ...	68	− 12
To Venezuela	10	− 4
Other telephone equipment—		
Total ...	731	− 19
To Canada	165	− 155
„ Japan	100	+ 72
„ Colombia	69	− 39
Starting, lighting and ignition equipment (except spark plugs)—		
Total ...	834	− 217
To Canada	122	− 49
„ Belgium	93	+ 14
„ Holland	52	− 31
„ Soviet Russia	80	− 78
„ Japan	62	− 13
Insulating material—		
Total ...	190	− 56
Metal conduit and switchboxes—		
Total ...	343	+ 36
To Brazil	46	+ 28
„ Colombia	30	+ 19
„ Argentina	30	− 15
Lighting switches, sockets, etc.—		
Total ...	525	− 165
To Mexico	89	+ 57
„ Canada	124	− 68
Insulated iron or steel wire and cable—		
Total ...	7	− 20
Rubber-covered copper wire—		
Total ...	432	+ 8
Telephone cable—		
Total ...	24	− 21
Insulated copper weatherproof wire—		
Total ...	150	*
Other insulated copper wire—		
Total ...	492	+ 102
Nickel-chrome elec. resistance wire—		
Total ...	285	*

* Not specified before 1933.

The London Chamber of Commerce

ONE of the most recent additions to the City's new buildings, that of the London Chamber of Commerce, stands on a corner site with a main frontage of nearly 70 ft. in Cannon Street, E.C.

The entrance hall

This modern steel-framed structure faced with Portland stone is quite simple in vertical aspect and free from unnecessary ornamentation. The principal entrance is relieved by a granite door surround, above which is an electric clock, and at first-floor level a pair of bronze torches of 300 W each serve to floodlight the facia.

The Interior Lighting

The main entrance hall, which accommodates the Information and Statistical Department, is the only apartment in the building above ground in which ample daylight is not available. The lighting fittings were made specially by the G.E.C. to the design of Messrs. Francis Polden & Co., Ltd., who carried out the electrical installation. These fittings are large flat rectangular bowls of white pearl and amber-coloured glass with a light steel frame affixed to plastered projections curving downward from the ceiling, to the base of which are attached the architectural-type lampholders. They ensure a warm even distribution of light.

Behind the entrance hall is a library and writing room in what will be the lighting well when the premises are developed rearwards. A large rectangular laylight has accordingly been provided in the ceiling, at each corner of which is a totally enclosed pendant similar to those of varying size used in the corridors and general offices. "Typerlite" desk lamps are also provided for the individual use of members of the staff and others using the rooms.

In the smaller meeting and conference rooms chromium-plated multi-lamp pendants of pleasing design have been installed. The council chamber can be divided by a folding partition. The walls are panelled and at the top reflector lamps are so concealed as to illuminate the entire chamber indirectly, no fittings whatever being visible.

Altogether there are about 350 lighting points, fifty plug points, a system of twenty-one electric bells, twenty-two "Genalex" G.E.C. clocks, and an inter-office Siemens automatic telephone system with thirty extensions, while the wiring for the Post Office telephones was carried out by the contractors with cable supplied by the G.P.O.

Messrs. Francis Polden used about 30,000 ft. of Enfield screwed steel conduit with Walsall fittings and Tucker bronze flush switches, while ten miles of Glover's wiring and cables have been installed.

Electricity is purchased from the City of London Electric Lighting Co., Ltd., the a.c. supply being controlled by Statter oil-immersed circuit-breakers and a metal-clad distribution board incorporating Vincent switch-fuse gear and Ferranti meters, which the contractors have built up on an angle-iron frame in a neatly accessible manner.

A separate small d.c distribution board serves two passenger lifts (Messrs. Hammond Bros. & Champness) and the pump motors. An electric calorifier provides hot water when the main heating plant is not in use. Motor driven air conditioning plant by Messrs. Rosser & Russell, Ltd., ventilates the lower section of the premises.

The control gear of the electrical installation

The Textile Machinery Exhibition

THERE is abundant evidence that textile machinists are fully alive to technical progress at the Textile Machinery and Accessories Exhibition at present being held in Manchester (October 26th to November 6th) The electric drive for textile machines of all types is gradually displacing steam. For winding machines the individual drive for each spindle is adopted for the higher class trade such as silk and rayon winding, but individual motors for each unit are being employed for all types of machines. It is common for manufacturers who require process steam to have their own power plant.

Brook Motors, Ltd., who have supplied most of the motors for the numerous working exhibits state that textile manufacturers in Lancashire and Yorkshire are placing more orders than they have done for some time past. There are a number of new mills being started up, and particularly for rayon weaving there is a good demand for electric motors. The firm is showing its latest capacitor start motor which gives the high starting torque required for textile winding machines, looms, &c. Among other Brook exhibits are the "Cylent" motor with sleeve bearing which obviates the necessity for an oil bath; a totally enclosed motor running in sawdust; and three motors demonstrating the firm's practice of making three grades "commercial," "standard" and "special."

The latest development in "P.I.V." and "H.R." gears are shown by Messrs. Stone & Co., Ltd., Deptford. The latest "P.I.V." box will run in any position. Remote control for these gear boxes is another new development, and this is demonstrated together with the new coloured lamp indicator. The same company is hoping to develop the Brown electro-megaphone system for textile mills. The type employed will give a speaking service with eight lines to different parts of the mill.

The latest types of hydro-extractors are shown by Messrs. Thomas Broadbent & Sons, Ltd.; these include a self-balancing electrically driven type, which attains a maximum speed of nearly 1,500 r.p.m. within 30 seconds, and is automatically stopped by the reverse current brake in as little as 20 seconds.

Among essentially textile apparatus may be mentioned a new warp stop motion for looms; a new electric twist testing machine operated by a small-power motor which tests the number of turns per inch in single and double twisted threads; and a series of electric shears for cutting all types and thicknesses of fabric for the clothing manufacturer.

The Sturtevant Engineering Co., Ltd., shows its card-cleaning system and industrial vacuum cleaning plant of special interest to the textile trade. The card-cleaning plant is of the multi-stage turbo exhauster pattern. Portable cleaners from ½ h.p. to 2 h.p. are shown together with small portable electric blowers for cleaning machinery.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments. Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Blackburn "Electricity Week"

Considerable success has attended "Electricity Week," organised by the Corporation Electricity Department at Blackburn, with the object of stimulating consumers. Believing in the policy of making the younger generation electrically minded, Ald. C. A. Critchley, J.P., Mayor, and chairman of the Electricity Committee, together with Mr. W. A. Royle, the borough electrical engineer, arranged for over 1,000 children from the secondary schools to inspect the Whitebirk power station and newly installed switchgear. These scholars came in batches in charge of their teachers and the whole system was explained to them. Members of the staff were also on duty in the evenings and Saturday afternoon for the purpose of explaining the system of generation to adults, and over 1,000 householders were entertained during the week. To each of these was handed a brochure to commemorate the recent extension of the switchgear. In addition, considerable interest was taken in a series of charts explaining the generation of electricity. A special display of domestic appliances was organised at the showrooms in Darwen Street. Since Mr. Royle introduced the assisted wiring scheme three years ago, nearly 3,000 people have taken advantage of it, whilst as a result of the recent reduction in the tariff there has been an increase of 14 per cent. in the consumption of electricity. Our picture shows Ald. Critchley pointing out to a party of scholars the principal features of the generating station and from their eager expressions it is apparent that the rising generation is keenly interested in electrical matters.

Blackburn scholars absorbed in the study of the plant at Whitebirk station

New Domestic Tariffs at Willesden

Mr. J. D. Spark, the electrical engineer and manager of the Willesden electricity undertaking, has sent us particulars of three new schemes which have been adopted by the Borough Council relating to rental wiring for lighting installations, all-electric kitchen equipment, and an extension of the hire and hire-purchase schemes relating to domestic electrical appliances. Under the rental wiring scheme all payments will be made through a prepayment meter. Lighting installations in domestic premises will be carried out by the Council for a minimum of four, and a maximum of eight points, with an addition of a plug and socket for electric iron, etc., if desired. The charges for the hire of the installations will be added to the cost per kWh and will be paid through a "penny in the slot" meter at 6d. per kWh, for a minimum consumption of 150 kWh per annum. In the event of the consumption falling below this amount an account for the difference at 2d. per kWh will be rendered. When the cost of wiring has been met, the prepayment meter will be adjusted to 4½d. per kWh. Under the "all-electric" kitchen scheme, where electricity is used for lighting, an electric cooker will be installed, complete with wiring up to 30 ft., and the "all-in" charge will be 1d. per kWh through a "penny in the slot" meter for a minimum consumption of 25 kWh per week. Rebates of ½d. per kWh will be made for electricity consumed in excess of certain amounts, according to the number of points installed. An electric iron, kettle or wash-boiler may also be installed, but with a slightly increased consumption stipulation. The new hire and hire-purchase scheme provides for the hire of kettles, irons and radiators at a small quarterly charge according to the nature of the apparatus, and under the hire-purchase agreement an increased quarterly charge. For hiring only the agreements will be for a minimum period of one year, and for hire-purchase a period of three years when the apparatus becomes the property of the hirer. Decorative imitation coal fires can be purchased at the end of three years by the payment of a small additional amount, or the hirer can extend his agreement for a further two years, after which the fire becomes his property.

Overseas Visitors to the B.I.F.

The Department of Overseas Trade announces that railway, shipping, and air lines in all the principal European countries are offering additional travel concessions to facilitate attendance of overseas buyers at the 1935 British Industries Fair. The reductions in fares now range from 10 to 50 per cent. Free passport visas, with a validity of three months, are also obtainable by overseas visitors to the Fair.

Diaries

We have received from Messrs. Iliffe & Sons Ltd. copies of the 1935 diaries of *The Wireless World*, *The Motor Cycle*, and *The Autocar*. These contain, in addition to the usual information, a great deal of interest to wireless enthusiasts, motor cyclists, and motor car owners. The first two are neatly bound in dark red leather cloth and the other in navy blue. They are obtainable from Messrs. Iliffe & Sons Ltd., Dorset House, Stamford Street, S.E., or from booksellers and stationers, at 1s. 6d. each, net.

Shanghai Commercial Counsellor's Visit

The Department of Overseas Trade announces that Mr. L. B. Beale, C.B.E., the Commercial Counsellor at Shanghai, is at present in this country on an official visit. He will be available at the Department of Overseas Trade for the period November 6th-30th for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to China, after which he will visit a number of industrial centres in the provinces. Firms desiring an interview with Mr. Beale or further information should apply to the Department at 35, Old Queen Street, London, S.W.1 (Reference 5529/1/34).

New Australian Company

A new company registered in Sydney, Australia, is Asea Electric Agency, Ltd., which has been formed with a capital of £10,000 to acquire from Asea Electric, Ltd., of London, the right and licence to obtain and sell in New South Wales the wares and merchandise manufactured and dealt in by Asea Electric, Ltd.

New Electricity Showrooms

The Southend-on-Sea Town Council has decided to lease premises in Elm Road, Leigh, for use as electricity demonstration and showrooms.

The Provincial Electric Supply Association

This Association held its annual meeting on October 29th, when Mr. S. S. Grant (chairman), in the course of his speech, said that the Electricity (Supply) Bill would come before the House of Commons during the current week, and their Committee still felt very strongly that its provisions were prejudicial to the interests of their members. It appeared that a motion had been tabled by a large number of Members of Parliament that the Bill should go to a Select Committee, and the motion had the Association's whole-hearted support. The chairman also referred to the opposition of the Bristol

Corporation to the Taunton Bill, which was withdrawn from the last session of Parliament, and to other resolutions which were being passed by local authorities, which, he said, must strengthen the case for a strict investigation of the Central Electricity Board's new measure. The chairman mentioned particularly the cordial relations which obtained between the Association and its kindred bodies, the Incorporated Association of Electric Power Companies, and the I.M.E.A., and paid tribute to the courtesy and understanding extended to the industry by the Electricity Commissioners.

Cinema Lighting

The architectural lamp owers to the designers of modern cinemas a new and effective medium for decorative lighting. Not only are these lamps particularly suited to modern decorative treatment, but they give adequate, shadowless illumination, ensuring the correct "atmosphere." One of the first cinemas to use architectural lamps for the general scheme of illumination is the Astoria Cinema at Cliftonville, designed by Mr. E. A. Stone, F.S.I. In the vestibule (shown in the accompanying illustration) there is a large centre feature, arranged in square formation, having two 4-ft. lamps per side. The smaller features have one 4-ft. lamp per side. A particularly interesting part of the installation is the 48-ft. centre lighting of the auditorium, which is made up of twelve 4-ft. lamps. The illuminated wall decorations are made up of four 20-ft. lengths, consisting of five 4-ft. lamps, two 16-ft. lengths, consisting of four 4-ft. lamps, two 12-ft. lengths, consisting of three 4-ft. lamps, and four 8-ft. lengths, consisting of two 4-ft. lamps. All the architectural lamps were sprayed a special amber colour, thus achieving a warm tone of comfort. The lighting scheme was drawn up by the consulting engineers, Messrs. C. H. Bell & Co., and the electrical contractors were the Berkeley Electrical Engineering Co. The architectural lamps, fittings and cable were supplied by the Edison Swan Electric Co., Ltd.

The vestibule of the Astoria Cinema, Cliftonville, illuminated by "Ediswan" architectural lamps

Power Station Visit

Headed by the Mayor (Councillor F. J. Humphries) members of the Newport (Mon.) Town Council paid an official visit last Friday to the Council's East power station and, at the invitation of the Central Electricity Board, the Newport grid sub-station. The party was welcomed by Mr. J. W. Beauchamp (area manager of the Central Electricity Board for South-West England and South Wales) and Mr. A. Nichols Moore (the Newport borough electrical engineer and chairman of the Board's Consultative Committee for the area).

"Remember, Remember . . ."

Huddington Court, historically famous because of its close association with the Gunpowder Plot, is being re-wired by Messrs. Abell & Smith's Electrical Co., Ltd., of Worcester, who are using Henley cables for the complete installation. From one of the windows shown in the accompanying picture Robert and Thomas Winter watched for the messenger who

Huddington Court, which is being rewired with Henley cable

was expected to announce the success or failure of the Plot. In later years Huddington Court fell into partial decay and was used as a farmhouse; but the remains have been carefully restored and repaired. Huddington Court still retains much of its traditional beauty.

Recent Contracts

The contract for the resignalling of Leeds station (L.M.S. and L.N.E. Railways) has been awarded to the Westinghouse Brake & Saxby Signal Co., Ltd. This installation will comprise a complete power signalling equipment at the West End employing the use of approximately forty-four searchlight signals, seventy-five disc, shunt and call-on signals, eighty-five a.c. track circuits, fifty-one power-operated point layouts, and all associated equipment, the whole being controlled from a central thumb-switch control panel in the West Cabin, utilising relay interlocking. The existing mechanical frame at East Cabin will be retained, but reduced in size, renumbered and entirely relocked. All associated rodding, cranks, &c., for point operation will be renewed. The signals at East End will be operated by circuit controllers supplied and fixed to lever tails. Lever locks will be incorporated with the circuit controllers. All indications at the West End will be on the control panel, and an illuminated diagram will be provided for the East Cabin, relay cabinets and train description are also being supplied. The contract includes the cable, disconnection boxes, &c., together with complete power supply equipment.

Amongst recent orders received by British Insulated Cables, Ltd., are the following: 85 tons of grooved cadmium copper trolley wire for the London Passenger Transport Board; 125 tons of cotton covered wire, for a manufacturer of electric motors; eight tons of aluminium sheet for a railway carriage manufacturer; 156 km. of hard-drawn copper aerial cable for Argentina; and 12,250 yds. route length of 33-kV pole line from Ferndale to Mountain Ash and Nantwen, for the Shropshire, Worcestershire, and Staffordshire Electric Power Co., together with 6,000 yds. of single-core 33-kV cable.

Trade Announcements

The Revo Electric Co., Ltd., is opening a new depôt and showroom on Monday next at 36, Park Cross Street, Leeds (telephone No. 24140; telegrams: Revo Leeds). The depôt will carry stocks of all Revo specialities, while the showroom will have a comprehensive display of the company's products.

Mr. W. E. Wilkins, northern representative of the Westinghouse Brake & Saxby Signal Co., Ltd., has removed to "Windgather," Moss Lane, Timperley, Altrincham (telephone: Altrincham 2808).

Mr. T. F. Trill, electrician and radio engineer, has opened premises in Station Road, Hawkhurst.

The goodwill and undertaking of the Times Electric Co., Ltd., 146a, Queen Victoria Street, E.C.4, has been acquired by Bristol Highway Appliances, Ltd., and the business is being carried on under the name of the Times Electric Co. at 7a, Kingly Street, W.1, and 13, Orchard Street, Bristol.

R.C.A. Photophone, Ltd., has removed its head office to Electra House, Victoria Embankment, W.C. (telephone: Temple Bar 2971).

An "Exide" Dance

Following on last year's success an "Exide" dance will be held at Tony's Major Ballroom, Birmingham, on December 5th. A cabaret has been arranged. Tickets are available at 2s. 6d. each and application should be made to Exide Batteries, 57-58, Dale End, Birmingham.

Prices of Materials

Messrs. F. Smith & Co. report, October 31st:—No change in the price of electrolytic copper wire rods. Electrolytic copper bars, £32 5s., £1 15s. increase. Electrolytic copper h.c. wire, 6¾d., ¼d. increase. Silicium bronze wire, 7¼d., ¼d. decrease.

Messrs. Edward Till & Co. report, October 31st.—India-rubber, Para fine, 5¼d., ¼d. decrease.

Messrs. James & Shakespeare report, October 31st: Copper bars (best selected), sheet and rod, £58, £2 increase. English pig lead, £12 15s., 5s. increase. Electrolytic copper sheets, £31 5s. to £32, £1 5s. increase.

The Bilston Electrical Exhibition

The Midland Electric Corporation for Power Distribution, Ltd., in conjunction with manufacturers and distributors, has arranged a series of exhibitions of domestic electrical apparatus, and the first was held recently at the Town Hall, Bilston, Staffs. The exhibition was opened on October 15th by the Mayor of Bilston. Mr. G. R. J. Parkinson, director and engineer of the company, said that in a small town it was impossible to run an electricity undertaking economically and cheaply on a small scale. It was only because his company

had a large area and a large output that it was able to make low charges. Bilston was the first of the Councils with whom they negotiated to recognise that it would be unsatisfactory for a town of that size to run its own electricity undertaking.

A Carnival Tableau

The Swindon Electricity Department recently entered a tableau in a local hospital carnival. This was the Department's first entry into carnival competition in which for the last three years the local gas company has carried off first prize. The pennant on the front bore the inscription "Progress," and this statement was substantiated by a summary

The Swindon Electricity Department's prize-winning tableau

of the Department's development in 12-in. letters showing the annual increase in the number of consumers connected since 1903 (the year of inauguration) until 1934 with 13,000 consumers. The tableau itself depicted a very old domestic scene, the cook and her policemen friends, and was brought up to date by the slogan "A Good Dinner for a Couple of Coppers." The prize-winning exhibit was afterwards taken round the town and outlying areas of supply and created a good impression.

Batti-Wallahs' Society

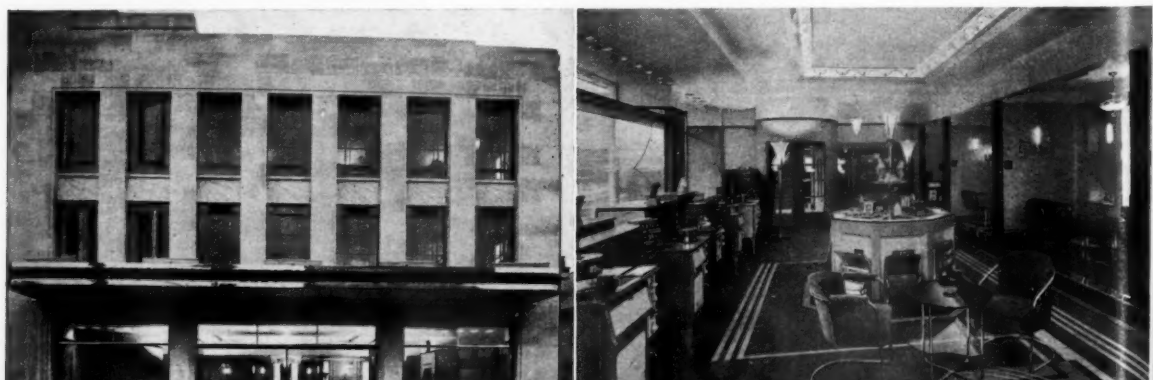
The annual dinner and dance of the Batti-Wallahs' Society has been arranged for March 15th next at the Hotel Metropole.

Commercial Electrical Travellers

The Electrical Trades' Commercial Travellers' Association is holding its annual dinner-dance at the Criterion Restaurant, W., on November 16th.

The New Wallasey Showrooms

In our last issue we reported the inauguration of the new showrooms of the Wallasey Corporation Electricity Department. We now reproduce two photographs sent us by Mr. B. T. Hawkins, the borough electrical engineer and manager,



Exterior and interior views of the new Wallasey electricity showrooms which were opened last week.

showing the imposing exterior and the modern design of the general showroom.

The England-Australia Air Race

Many of the machines which took part in the race from Mildenhall Aerodrome to Melbourne received their final tuning up under the light of G.E.C. floodlights equipped with "Osram" lamps. These floodlights were installed temporarily by Messrs. Hill Upton & Co., of Oxford, to the instructions of the Royal Aero Club. They were used principally for illuminating the hangars, but being mounted on swivelling bases they were also used for providing light for working on the various machines using the aerodrome during the period of the race preparations.

The engines of the aeroplane in which Capt. C. W. Scott and Mr. T. Campbell Black won the great air race were fitted with B.T.H. magnetos. These magnetos were also fitted to all the British aeroplanes taking part in the race.

Aircraft fittings made by Brown Brothers, Ltd., were also incorporated in both machine and engine of the winning plane.

Practical Electro-plating

Messrs. W. Canning & Co., Ltd., have published a twelfth edition of their "Practical Handbook on Electro-plating" which was first issued as far back as 1899. The matter has been considerably augmented to bring it abreast of modern developments—particularly chromium plating—and the work forms a most useful manual on this important art.

Works Visit

About sixty-five members of the Electrical Association for Women made an official visit to the works of Venner Time Switches, Ltd., on October 18th and were keenly interested in all that they saw. Private conveyance was arranged for them by the company and the visit concluded with a tea and speeches.

The Brighton Swimming Pool

We are asked to state that a regrettable error occurred in the advertisement of Edison Swan Cables, Ltd., on the front cover of the ELECTRICAL REVIEW dated October 19th, which dealt with the new Swimming Pool at Brighton. The mistake has been rectified in the advertisement appearing in to-day's issue, which gives the correct name of the contractors as Drake & Gorham, Ltd., 36, Grosvenor Gardens, S.W.1.

World Tin Statistics

The September issue of the *Bulletin* from The Hague Statistical Office of the International Tin Research and Development Council shows that in the first seven months of 1934 the "apparent" world consumption of tin was 68,641 tons, compared with 71,106 tons for the corresponding period of 1933. These figures must not be taken as a comparative measure of actual consumption during these periods because, since the beginning of this year, as the *Bulletin* shows, "invisible" or consumers' stocks have been reduced in the United States by about 8,000 tons, which has passed into consumption. The improvement in automobile production accounted for just over 2,000 tons of the increase. Tin consumption by individual countries is given in the following table:—

	Twelve months ended July, 1933.	1934.
	Long tons.	
United States	46,519	52,046
United Kingdom	18,368	20,915
Germany...	8,824	10,788
France	10,027	9,466
Soviet Russia	3,390	4,933
Italy	3,692	4,000
British India	2,017	2,000
Total	92,837	104,148
Total world consumption ...	110,221	124,800

A Vacuum Cleaner Competition

In connection with the competition promoted by British Electric Domestic Appliances, Ltd., for suggestions for improving trade sales of vacuum cleaners, for which the results of the dealers' section have already been announced, in the wholesalers' section the prizes were awarded as follows:—First prize: Mr. R. Leech (Osmond & Matthews, Ltd.); second prize: Mr. F. H. Trewhella (Manufacturers' Accessories Co. (1928), Ltd.); third prize: Mr. F. Pollard, Nottingham (Hobday Bros., Ltd.).

British Radio Apparatus in Ceylon

The growing popularity of wireless in Ceylon has resulted in greatly increased sales of British-made receiving sets. From the period July 1st, 1933, to June 30th, 1934, the value of

accessories and apparatus imported from the United Kingdom amounted to over £7,000, as compared with £4,264 for the corresponding period in 1932-33. Imports from Japan, Holland and the United States have also increased, although their figures are far behind those of the United Kingdom.—*Reuter* (Colombo).

Cooking Demonstrations at Coventry

With reference to the note which appeared in our last issue under this heading, the General Electric Co., Ltd., asks us to state that the chairman of the Coventry Corporation Electricity Committee is Mr. W. H. Malcolm and not Councillor Adams, as stated.

Our Domestic Special

Referring to the comments on p. 535 on the P.W. "all-in" plug system introduced by Messrs. George H. Scholes & Co., Ltd., we are asked to make it clear that the fused plug fits into the "Minor" socket, the dual plug, and also into the 15-A socket, so that it can be used anywhere where there is a socket outlet.

The price of the 13-in. "Rotoscythe" lawn mower mentioned in our issue of Oct. 19th is £15—not £9 9s.

The Cannock Electrical Exhibition

The progress of electricity during the years of trade depression was referred to by Sir William Ray, executive chairman of the E.D.A., in opening an electrical exhibition at the Queen's Hall, Cannock, on Monday last. If electricity had made such advances during the bad period, as was undoubtedly the case, what more could it do in good times? He felt sure that the complete electrification of the country in the very near future was absolutely inevitable. Among those who attended the opening were: Mr. S. T. Allen (Central Electricity Board); Mr. A. N. East, technical assistant to the Electricity Commissioners; Captain J. C. Chaytor, chairman of the E.D.A. Area Committee; Mr. V. W. Dale, business manager of E.D.A.; Lt.-Comdr. A. E. Neal, Area Officer, Central England, E.D.A.; Ald. Bell and Mr. E. J. Hetherington (West Midlands Joint Electricity Authority).

Social Events

The Lewcos Dramatic Society (London Electric Wire Co. & Smiths, Ltd.) is presenting "The Rotters," by H. F. Maltby, at the Guildhall School of Music, London, E.C., on Tuesday next.

The Automatic Electric Co., Ltd., held its annual dinner on October 26th at the Adelphi Hotel, Liverpool. The function comprised a dinner, whist drive, dance and cabaret, and was attended by a large number of the personnel of the company.

New Catalogues and Lists

B.E.N. Patents, Ltd., Gorst Road, Park Royal, London, N.W.—An air compressor catalogue.

Switchgear & Cowans, Ltd., Old Trafford, Manchester.—A leaflet entitled "Working in the Dark."

Falk, Stadelmann & Co., Ltd., 83/93, Farringdon Road, E.C.1.—A catalogue of lamps and radio goods.

Ruston & Hornsby, Ltd., Lincoln.—A catalogue of "Economic" boilers.

Bulpitt & Sons, Ltd., Swansea Works, Camden Street, Birmingham, 1.—A leaflet on the "Swan" wash-boiler.

Higgs Motors, Ltd., Birmingham, 6.—A pocket catalogue of Higgs motors.

R. Johnson, Clapham & Morris, Ltd., Jacem House, Trafford Park, Manchester.—A lighting catalogue.

Grace Engineering Co., Ltd., 143, Leadenhall Street, E.C.3.—A catalogue of "Smoot" regulators.

Fuller Accumulator Co., Ltd., Woodland Works, Chadwell Heath, Essex.—A leaflet on "inert" high and low tension batteries.

Babcock & Wilcox, Ltd., Farringdon Street, E.C.4.—A copy of "Valve Value."

Ferranti, Ltd., Hollinwood, Lancs.—Three constructors' charts of short-wave radio receivers.

General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.—A new catalogue of "Osram" projector lamps.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, Oxford Street, W.1.—Leaflet describing the company's range of automatic kettles.

Siemens Electric Lamps & Supplies, Ltd., 38/39, Upper Thames Street, E.C.4.—A leaflet on radio valves.

Benjamin Electric, Ltd., Brantwood Works, Tottenham, N.17.—A folder on electric discharge lamp fittings and a copy of "The Benjamin Reflector."

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, North Acton, W.3.—A catalogue of condensers and resistances.

Hackbridge Electric Construction Co., Ltd. Hersham, Walton-on-Thames.—A complete bound catalogue of transformers, voltage-regulating equipment, &c.

Bankruptcy Proceedings

D. C. Hayes, 44, Burman Road, Shirley, lately trading as the "Streetsbrook Electrical Co.," Bank Chambers, 195, Bromsgrove Street, Birmingham, formerly 1,287, Stratford Road, Birmingham, electrical contractor.—The public examination herein took place on October 24th at the Court House, Birmingham. The statement of affairs showed gross liabilities of £2,240 and a deficiency of £1,046. Debtor said he commenced business in October, 1930, without capital, at premises in Solihull Lane, Hall Green. In February this year he entered into a verbal partnership with another, the latter finding capital of £400. In April debtor's partner withdrew, and debtor agreed to pay him £350. Debtor continued the business but it was not successful. He attributed his failure to insufficient capital, bad position of shop, bad trade, and heavy law costs. The examination was provisionally closed.

L. Holzman, manufacturer of wireless and electrical equipment, 1, Robert Street, Hampstead Road, London, N.W.—Under a receiving order made on October 9th on a creditor's petition the first meeting of creditors was held on October 23rd at Carey Street, W.C. A statement of affairs was submitted showing liabilities of £1,701, of which £291 are expected to rank for dividend, and assets nil. According to the debtor, from 1925 until 1928 he traded as an importer and distributor of electrical, &c., products. The business was then converted into a limited company, and he received 1,000 shares of £1 each. But some twelve months later, owing to lack of business, it ceased to function. In 1929 he formed another company. The claim of the petitioning creditor mainly relates to costs in connection with legal proceedings and certain of the items are disputed. The debtor attributes his insolvency to loss of income owing to cessation of business by a limited company and lack of trade. The meeting left the matter in the hands of the Official Receiver.

W. E. Magson, electrical engineer, 10, Castlegate, Malton, Yorks.—Receiving order made October 23rd on debtor's own petition.

F. D. Simpson, electrical engineer, 101, Cleveland Street, Doncaster.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released October 18th.

A. G. Overton, electrical engineer, 75a, Pasture Street, Great Grimsby.—First and final dividend of 4s. 4¾d. in the £, payable October 30th at St. Mary's Chambers, Great Grimsby.

C. A. Whittington, electrician and wireless dealer, 400, Abbeydale Road, Sheffield.—Trustee, Mr. L. J. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released October 20th.

D. Tweedle, radio and electrical engineer, 42, Market Street, Milnsbridge, Huddersfield.—First and final dividend of 1s. 0¾d. in the £, payable November 8th at 71, Manningham Lane, Bradford.

Private Arrangement

H. R. Garrett, 18, Ship Street, Brighton, electrical engineer.—At a recent meeting of creditors at the offices of Mr. A. E. Orbell, 6/7, Old Steine, Brighton, a statement of affairs was submitted, which showed ranking liabilities of £1,491 and net assets of £710, leaving a deficiency of £781. It was decided that, subject to the cash claims being withdrawn, the matter should be dealt with under a deed of assignment with Mr. Orbell as trustee. The following are creditors: Drake & Gorham (Wholesale), Ltd., £454; Franco British Electrical Co., Ltd., £50; General Electric Co., Ltd., £256; W. T. Henley's Telegraph Works Co., Ltd., £109.

Company Liquidations

A. Bodkin & Co., Ltd., 16, Cornfield Road, Eastbourne, wireless and electrical dealers.—The statutory meeting of creditors in this matter was held on October 26th at Winchester House, Old Broad Street, E.C.2, when a statement of affairs prepared by Messrs. Morgan Bros. & Co., 54, New Broad Street, E.C.2, was submitted which disclosed liabilities of £2,872, of which £2,562 was due to trade creditors, the bank being creditors for £309. The net assets were £1,177, leaving a deficiency of £1,695. According to a deficiency account submitted, there was a total deficiency to be accounted for of £4,695, which was explained by the losses on trading from June 28th, 1928, to October 23rd, 1934, £2,647; and losses and depreciation written off the assets, £2,047. The issued and paid-up capital of the company was £3,000, so that there was a total deficiency as regarded contributories of £4,965. The shareholders had previously passed a resolution nominating Mr. Greave, of Messrs. Morgan Bros., as liquidator of the company, and the creditors decided to confirm his appointment. A committee of inspection was also nominated consisting of the representatives of three of the creditors.

Importers and Distributors, Ltd., electric lamp dealers, 173-175, Great Portland Street, W.—The accounts lodged under the compulsory liquidation of this company show liabilities of £2,419, assets of £1,263, and a deficiency of £1,328 with regard to contributories, the issued capital amounting to £100. The Official Receiver (who also acts as liquidator) reports that the company was registered in 1923 to deal in electric lamps imported from Holland and Austria. A branch was opened in Glasgow in 1927, but was carried on at a loss and was discontinued after a year's trading. Owing to increased tariffs on imported goods the company ceased to obtain electric lamps from abroad in 1930 and thereafter under the style of "The All-British Electric Lamp Co." dealt only in goods manufactured in this country. Debentures for £1,400 were issued as security for cash loans, and on January 9th, 1934, Mr. A. C. Watts-Jones was appointed receiver for the debenture holder. The assets had realised £1,242, which is absorbed in the debenture claim, and consequently no dividend can be paid to the unsecured creditors. The failure of the company is attributed to lack of capital, bad trade, keen competition and faulty lamps.

Mead Electric Co., Ltd.—Particulars of claims by November 6th to the liquidator, Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.

Parkers Radio Co., Ltd.—Winding up voluntarily. Liquidator, Mr. J. T. Chaplin, National Provincial Bank Buildings, Hertford Street, Coventry.

Dualite, Ltd.—Meeting November 23rd at Audrey House, Ely Place, E.C., to receive an account of the winding-up by the liquidator, Mr. W. E. Ogden.

Vessco, Ltd.—Meeting November 28th at 33, Percy Street, W., to receive an account of the winding-up by the liquidator, Mr. N. Bell.

Associated Radio Distributing Co. (London), Ltd.—Meeting November 28th at 115-117, Cannon Street, E.C., to receive an account of the winding-up by the liquidator, Mr. G. C. Jarvis.

Kenneth Brooks (Radio & Television), Ltd.—Meeting November 5th at 115-117, Cannon Street, E.C., to receive an account of the winding-up by the liquidator, Mr. G. C. Jarvis.

Dissolution of Partnership

Henry Ford Radio, 56, Howland Street, Tottenham Court Road, W.—Messrs. L. C. H. Ford and A. J. M. Houbaer have dissolved partnership.

Electricity Supply

Lighting, Domestic, Power

Accrington.—LOAN.—The Haslingden Corporation has decided to obtain electricity from Accrington and Rawtenstall Corporations on the basis of two-thirds and one-third, respectively. The Town Clerk of Accrington is to apply to the Electricity Commissioners for sanction to borrow £6,000 to cover the estimated capital cost of providing the supply.

Ayrshire.—ELECTRICITY BOARD'S REPORT.—The Ayrshire Electricity Board's report for the year ended May 15th last, which has been sent to us by the engineer and general manager, Mr. W. C. Bexon, shows a total revenue of £301,661, or £14,165 more than for the previous year. Working expenses amounted to £178,929 and the net profit to £6,786, which is £764 more than in 1932-33. The amount of electricity sold was 7,180,304 kWh in excess of the 1932-33 figures, equivalent to an increase of 14.9 per cent., and constituted a record. This increase was largely due to a revival in the power load. About 3,500 new consumers were connected during the year, bringing the total on circuit to 29,125, with a kW load of 96,213. The highest maximum-demand figures were 19,150 kW for the Kilmarnock power station and 1,680 kW for Saltcoats sub-station. This was an increase of 2,078 kW over the previous year.

Birmingham.—PROGRESS.—The secretary of the City Electric Supply Department informs us that the Department's sales during the September quarter showed an increase of 14½ per cent. This gives an increased sale of about 35 million kWh for the half-year, which is 17 per cent. above the corresponding period of last year. During the six months 7,700 additional premises in the area have been connected, consisting of a total of 73,300 lamps and 42,500 h.p. in power and industrial supplies.

Cardiff.—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated cost of £1,844.

Chichester.—LOANS.—Application is to be made for sanction to loans of £30,182 for the Wittering extension scheme and £2,304 for sub-station buildings.

COUNCIL HOUSE SUPPLIES.—The two-part tariff is to be extended to Council house tenants.

Croydon.—LOAN.—The Electricity Committee is to raise £27,234 for mains distribution.

Deeping St. Nicholas.—ELECTRICITY WANTED.—The Parish Council is approaching the Spalding Urban District Council with a view to securing a supply of electricity for the village.

Devizes.—EXTENSIONS.—The West Wilts Electric Light & Power Co. is to extend mains to supply Market Lavington, Fiddington and Fiddington Sands.

Two examples of recent G.E.C. lighting. On the left is the new electric discharge ("Osira") installation at Scarborough Road, Bridlington, while the picture on the right shows a 1,000-W "Osram" installation at Trafalgar Square

Eastbourne.—A YEAR'S PROGRESS.—Considerable progress in the domestic field is shown in the annual report of the electrical engineer, Mr. J. K. Brydges. The number of cookers on hire increased from 2,653 to 3,292 and the water heaters by 370 to 1,224. Wash-boilers rose from 289 to 483 and motors from 1,074 to 1,196. With regard to the water heaters on hire, the 3- and 12-gal. sizes were most popular. The net profit per kWh sold rose from 0.04d. to 0.10d. The total amount of electricity sold was 28,640,107 kWh, an increase of 12.3 per cent., and there was a total revenue of £216,769. Working expenses were £145,029. The corresponding figures for the previous year were £211,664 and £143,215.

PROPOSED EXTENSION.—Sanction to a loan of £6,616 for electricity extension to Polegate Farm Estate is being sought by the Finance Committee.

Glasgow.—FURTHER REDUCTIONS WANTED.—The Corporation has decided to ask the Clyde Valley Electrical Power Co. for a further reduction in the charges to consumers within the city. The company recently intimated a reduction of 10 per cent.

MAINS EXTENSIONS.—The Electricity Committee has agreed to the laying of distributing mains (£4,545).

Great Yarmouth.—STREET-LIGHTING SUPPLY.—The Lighting Committee has obtained sanction to borrow £6,405 for improving the lighting of the main roads.

Greenock.—IMPROVEMENT.—The increased revenue of the Electricity Department during the past year reflects improved trade in the area of supply. For industrial power alone the consumption increased by 50 per cent., while the total increase in kWh sold was in excess of 3½ millions, or 33.6 per cent. The audited accounts for the year show a deficit of approximately £4,000, but the actual trading result was a credit balance of £6,000 before making a repayment of £10,000 advanced to meet an adverse balance in the previous year. The Corporation has sanctioned a further change-over of supply from d.c. to a.c.

Guildford.—SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to an estate at Bannister's Farm, in course of development by Mr. H. Ashenden, at an estimated cost of £1,500, and also to a new estate at Compton Farm, Frog Grove Lane, Wood Street, to be developed by Mr. C. F. Cull.

Hailsham.—RURAL SUPPLY.—The Weald Electricity Supply Co., Ltd., has informed the Rural District Council that a canvass of Arlington is being made with regard to a supply. The Company has intimated that it will not agree to a Fringe Order, or to alterations in their boundaries of supply.

Hemel Hempstead.—SUPPLY EXTENSION.—The Rural District Council has decided to offer no objection to the Chesham Electric Light Co. extending the overhead lines from Great Gaddesden so as to afford a supply to Water End.

High Wycombe.—INQUIRY.—Mr. Gordon Tucker held a Ministry of Transport inquiry on October 16th into the application of the Wycombe and Wessex Electric Light Companies for permission to erect overhead lines in the areas of Booker Village, Cressax Lane, and Chorley Road. There was objection by the Town Council to the overhead lines.

Isle of Wight.—REDUCED CHARGES.—The Isle of Wight Electric Light & Power Co., Ltd., has decided to reduce its charges, following the success of the two-part tariff.

Liverpool.—INQUIRY.—Mr. Henry Nimmo, chief engineering inspector to the Electricity Commissioners, held an inquiry at Liverpool on October 23rd and 24th into an application by the Corporation for permission to supply electricity to Altcar, Downholland, Melling and Simonswood. The application was opposed by the Lancashire Electric Power Co. Mr. H. Shawcross, for the Corporation, said it was only recently that the Power Co. had taken the slightest interest in providing supplies to these districts. Mr. P. J. Robinson, city electrical engineer, said the estimated capital expenditure for supplying the new areas concerned was £27,466, and the revenue £5,025 per year. It was proposed to charge a flat rate of 5d. per kWh, which would be reduced by annual reductions in eight years to the flat rate charged in Liverpool (now 3¼d.). If the Liverpool rate dropped lower that in the new areas would do likewise.

LOAN.—The Electric Power and Lighting Committee recommends, subject to the approval of two other committees, application to the Commissioners for sanction to borrow the sum of £13,000 for the provision and installation of additional evaporating plant at the Clarence Dock Power Station and of a steam main from the station to the premises of Messrs. J. Bibby & Sons, Ltd., Great Howard Street.

London.—HAMMERSMITH.—The Electricity Committee recommends various reductions involving concessions totalling £25,653 per annum. The lighting rate of 3d. is to be reduced to 2¾d.

ST. PANCRAS.—The Electricity Committee recommends that application be made to the Electricity Commissioners for a loan of £69,497, and that mains be extended at a cost of £1,266.

A FURTHER "CLESCO" CONCESSION."—The County of London Electric Supply Co., Ltd., announces that the two-part "all-in" domestic tariff is now available to prepayment-meter consumers.

Manchester.—NEW MAINS.—The Electricity Committee is seeking sanction to borrow £250,000 for distributor mains.

Matlock.—OVERHEAD LINES.—The Derbyshire & Notts Electric Power Co. proposes to erect overhead lines to the new Hooley Estate, Darley Dale, and also to Hackney.

Mountain Ash.—CHEAPER ELECTRICITY.—The Council has accepted the recommendation of its electricity manager (Mr. E. W. Jones) that a special discount of 2d. per kWh should be given to consumers for the quarter ending December 31st

next. With this reduction the net prices for lighting at Mountain Ash, it is claimed, will be the lowest in the country. They will be 1d. per kWh for ordinary meters, 1½d. per kWh for prepayment meters (ordinary rate), and 3½d. per kWh for prepayment meters (assisted-wiring rate). In all, the concession represents a saving of about £4,000 so far as consumers are concerned.

New Brighton.—PROMENADE LIGHTING.—The new lighting equipment on the promenade consists of Revo steel poles suitably ornamented with double- and single-arm brackets and hexagonal decorative lanterns. These fittings are disposed along the 180-ft.-wide main promenade, with single-arm brackets on the footwalks and double-arm brackets on islands down the centre and along the river frontage at an average spacing of 120 ft. The light sources (500-W gasfilled lamps) are situated 21 ft. above the road surface, and the type of lantern has been specially considered with a view to the adoption of electric discharge lighting at any time. The resultant illumination is bright and cheerful and enhances the pleasing decorative character of the layout. The lighting equipment has been designed and supplied specially by the Revo Electric Co., Ltd., Tipton, to the instructions of Mr. B. T. Hawkins, electrical engineer and manager.

Revo Lighting at New Brighton

Newcastle-upon-Tyne.—THE TRAMWAYS SUPPLY.—Representatives of the Electricity Commissioners have visited the town to decide the future of the Corporation's Manors power station, which is used for supplying current for the tramways and street lighting. In the opinion of experts, the station cannot be made efficient. If the Corporation adopted the grid system for the tramways it would then become a customer of the North-Eastern Electric Supply Co., and, according to some members of the Council, this would prejudice the Corporation if at any time it decided to exercise its option to purchase the Company's distributive system.

New Zealand.—THE WAITAKI SCHEME.—The Waitaki hydro-electric station in Otago, the construction of which began in 1928, was opened last week by the Governor-General, Lord Bledisloe. The initial installation is 30,000 kW, with provision for extension to 75,000 kW. The development is one of the boldest undertakings yet attempted in New Zealand, necessitating the use of coffer dams in the construction of an 1,800-ft. dam across a snow-fed river subject to severe flooding. The station is linked by h.p. transmission with Coleridge and Waipori, forming a South Island grid. Lord Bledisloe, in opening the station, said that electricity was now available to 94 per cent. of the Dominion's population. The average consumption was about 500 kWh a head annually.—*The Times.*

North Wales.—ELECTRICITY CHARGES.—The North Wales and South Cheshire J.E.A. decided at a recent meeting to submit a memorandum to the Electricity Commissioners stating that unless better terms for supplies from the grid are forthcoming the J.E.A. will be unable to carry on.

Public Utilities (Electric), Ltd., employés laying a cable which is to provide Thurso (Caithness) with electricity

Oxford. — LOAN. — The Electricity Committee is seeking sanction to a loan of £15,000 for mains, switchgear, transformers and kiosks.

Peterborough.—EXTENSIONS.—The Mid-Lincs Electric Supply Co. proposes to extend overhead and underground lines at Northborough.

Portsmouth.—SPECIAL ORDER.—A special meeting of the City Council is to be held on November 9th to decide whether application shall be made to the Electricity Commissioners for a Special Order authorising the Electricity Department to supply parts of Gosport not already in the Portsmouth Corporation's distribution area.

Ripon.—TRANSFER OF UNDERTAKING.—The proposed transfer of the undertaking to the Harrogate Corporation was the subject of a recent City Council meeting. A resolution was adopted that there should be inserted in the agreement a clause to the effect that Harrogate shall refund to Ripon the whole of the initial expenses in promoting the Provisional Order for the electricity undertaking.

Scotland.—ELGIN.—The Grampian Electricity Corporation is negotiating for the purchase of the Elgin undertaking.

Shrewsbury.—SUPPLY NEGOTIATIONS.—Negotiations are stated to be proceeding between the Electricity Committee and the West Midlands J.E.A. regarding the supply of electricity to the districts recently absorbed into the borough. The J.E.A. possesses the statutory rights to supply the areas in question, but the Electricity Committee is anxious to extend its activities to serve the whole of the borough.

Southend-on-Sea.—NEW ALTERNATORS.—The Town Council has decided to fit alternators on two of the Diesel engines at the London Road generating station, which at present have d.c. generators. The estimated cost is £6,000. Various mains extensions are to be carried out, including an h.v. main from Ness Road to High Street, Shoeburyness, the latter at a cost of £2,027.

South Wales.—FARM SUPPLIES.—Over 200 farms and smallholdings (excluding village consumers) are now supplied by the South Wales Electric Power Co.

Stoke-on-Trent.—EXTENSION.—The Electricity Committee is to provide a supply, costing £2,000, to 350 houses in Sandon Road, Meir, now in course of erection, and to extend mains at an estimated cost of £3,750.

LOAN.—The Committee has obtained sanction to borrow £60,000 for mains and services.

Sweden.—POWER DISTRIBUTION.—Lecturing before the Technical Association at Lorensberg, Mr. W. Bergquist, chief director of the Swedish Waterfalls Board, is reported to have stated that, despite the serious water shortage this year, the production of electric power up to September 1st amounted to 5.6 milliard kWh, or 10 per cent. more than in any previous year. That it was possible to achieve so much was due to the co-operation between the hydro-electric works and the steam power stations. This co-operation forms one of the chief points in the administration's programme during the next ten years, and it is also proposed to co-operate with the private power stations. The interconnection of works by means of 132,000-V long-distance transmission lines is also being carried out, together with independent lines for use in case of emergency.

Todmorden.—LOAN.—The Electricity Committee is seeking sanction to borrow £1,000 for meters.

Totnes.—ELECTRICITY FOR STOKE GABRIEL.—The Rural District Council is to apply to the Electricity Commissioners for approval of an electricity scheme for Stoke Gabriel, and work on the scheme will commence as soon as official permission is received.

Tynemouth.—REDUCED CHARGES.—The Town Council has agreed to reduce the price of electricity from 4d. to 3½d. per kWh for all prepayment-meter consumers, including cinemas, &c., to take effect as from October 1st.

United States.—HARNESSING WATER POWER.—The 150-mile aqueduct which is to supply San Francisco with water from the Sierra mountains was opened on October 21st. It has taken twenty years to build and has cost more than $100,000,000 (£20,000,000). Plant is to be installed so that the flow of water can be harnessed to produce electrical energy.—*Reuter.*

Wimbledon.—LOANS.—The Electricity Committee is seeking sanction to borrow £30,000 for mains and house services and £5,000 for sub-stations, and the installation of a 200-kW Diesel generator.

Wolverhampton.—SUPPLY EXTENSIONS.—The Electricity Committee is to provide a supply to Harriot's Hayes and has authorised extensions and alterations of mains at Mount Road, Penn, the total estimated cost being £1,567.

Yarrow.—NEW CABLES.—The North Eastern Electric Supply Co., Ltd., has decided to renew the cables in the town at a cost of £30,000. It is expected that about a hundred local men will be employed until next March. Yarrow has suffered considerably through the industrial depression.

Traction

Australia.—MELBOURNE TRAMWAYS.—A copy of the annual report for the year ended June 30th, 1934, which we have received from Mr. T. P. Strickland, chief engineer to the Melbourne and Metropolitan Tramways Board, shows a total revenue of £1,959,547 (£1,929,738), working expenses amounting to £1,197,320 (£1,184,495), and a net surplus of £450,223 (£421,837). The figures given in parentheses are those of the previous twelve months. The total number of passengers carried amounted to 166,454,174, (163,694,945), including 6,938 (7,075) by petrol buses, while the mileage covered was 22,001,509 (21,930,009), the omnibuses covering a little over 9,000 miles. This gave a revenue per mile of 22.34d. for the trams and 17.41d. for the buses. The Board now controls 114 route miles of electric and 24 miles of cable tramways.

Austria.—RAILWAY SUB-STATIONS.—In *Elektrotechnik und Maschinenbau* some particulars are given of the transforming and coupling stations which have been installed on the electrified sections of the Austrian State Railways. Altogether twelve sub-stations have so far been erected, these being supplied in parallel with power at 50,000 and 60,000 V from hydro-electric stations. The author of the article mentions that special protective devices have been installed in connection with the control of the temperatures of the transformers, any abnormal rise being indicated both by optical and sound signals. For the auxiliary services d.c. is provided by 12-16-kW rotary converters, which feed batteries of accumulators ranging in capacity from 216 to 378 Ah.

Brighton.—THE TRANSPORT PROBLEM.—Mr. Marsh, the tramways manager, has submitted a lengthy report on the subject of the best means of improving and extending the transport system in the town. Mr. A. C. Baker, of Birmingham, has also reported on the subject. Both reports deal in detail with the possibilities of adopting the trolley-bus system or heavy-oil-engined buses, and with the question of either purchasing Messrs. Tilling's undertaking or working co-operatively with that firm. It is reported that the Southdown Co. is not willing to sell any portion of its undertaking. The Brighton General Purposes Committee recommends that the Councils of East Sussex, West Sussex, Brighton, Hove, Portslade, Southwick and Shoreham be invited to send representatives to a conference on the subject.

Germany.—MAIN LINE CONVERSION.—Electrification of the 50-mile Magdeburg-Kothen-Halle section of the main line from Hanover to Leipzig has just been completed, and the passenger trains are now being hauled by electric locomotives. This line is an extension of the central German electrified system, and as power and converting plant was in existence at Halle and Magdeburg, only one new sub-station has been built.

Irish Free State.—MODERNISING THE RAILWAY SIGNALLING.—It has been decided to adopt electrically operated signals on the Great Southern Railway at Dublin.

Portsmouth.—AGREEMENT TO BE TERMINATED.—Hampshire Light Railway (Electrical), Ltd., proposes to terminate the agreement relating to the through-running of the Horndean trams at the expiration of three months from October 3rd.

TROLLEY-BUS EXTENSIONS.—Application is to be made by the City Council to the Minister of Transport for a Provisional Order authorising the Council to operate trolley-buses on a number of new routes. Sanction is sought to loans of £36,000 for the provision of the new vehicles required and £18,000 for the necessary equipment, constructional works, &c.

South Shields.—ANNUAL REPORT.—The general manager of the South Shields tramways, Mr. E. R. L. Fitzpayne, reports that there was a total revenue of £67,150 for the year ended March 31st, 1934. Working expenses amounted to £51,967 and the net surplus to £133. During the year 1,125,391 car-miles were covered and 15,312,093 passengers were carried.

Spain.—NEW RAILWAY EQUIPMENT.—Orders have just been placed for the supply of twelve express and twenty-four goods train electric locomotives, thirty motor-equipped coaches and other material required in connection with the Madrid-Segovia and Madrid-Avila railways.

United States.—A HIGH-SPEED TRAIN.—Last week a new 900-h.p. Diesel-electric train, 370 ft. long and capable of carrying 120 passengers, covered the journey from Los Angeles to New York (3,334 miles) in 57 hours, whereas the normal time for the journey is 84 hours. An average speed of 84 m.p.h. was maintained from Cheyenne (Wyoming) to Omaha (Nebraska), the maximum speed of 120 m.p.h. being reached just after leaving Cheyenne.

Communications

Australia.—FILM TRANSMITTED BY WIRELESS.—An unretouched film of the arrival in Melbourne of Scott and Campbell Black was wirelessed direct from Australia to London by Cable & Wireless, Ltd. Each "frame" had to be transmitted separately. The magnitude of the task may be gauged from the fact that each picture in the film took just over half an hour to transmit from Melbourne to Moorgate, though they appear on the screen at the rate of twenty a second. The pictures when received measured 10 in. by 8 in. Each had to be rephotographed by a cinema camera and reduced to the much smaller size required by the standard cinema projector.

WIRELESS LICENCES.—The number of wireless receiving licences in Australia continues to increase. At the end of August the total in force in the Commonwealth was 636,631, an increase on the previous month of 22,957.

China.—NATIONAL TELEGRAPH CONFERENCE.—A number of interesting resolutions relating to the telegraph administration, telephone administration, telegraph and telephone equipment, and training of telegraph and telephone experts have been adopted at the National Telegraph Conference recently convened in Nanking by the Ministry of Communications. With regard to the telegraph service, it was decided to establish direct telegraph communication as follows: Fukien, Kuangtung; Hankow, Canton; Chengchow, Lanchow; Chungking, Yunnan; Chungking, Kuiyang; Canton, Nanning; Yunnan, Kuiyang; Changsha, Kuichow; Hengchow, Kuangsi; and Hunan, Kiangsi. Light telegraph lines, originally installed for military purposes, will be taken over from the military authorities and repaired with funds from the Boxer Indemnity Refunds. In order to expand the wireless service to South China the Conference decided to recommend to the Ministry the installation in Shanghai of automatic radio apparatus for communication with Foochow, Amoy, Swatow and Canton. It was decided that radio stations should be established in the frontier provinces and smaller stations in bandit-suppression areas. For the expansion of the international service, present plans call for the establishment of branches of the International Radio Station at Amoy, Canton, Hankow, Tientsin, and Nanking. The erection of marine wireless stations along the coast at Haichow, Wenchow, Foochow, Amoy, Swatow, Canton, Hainan Island, Peihai, and Hsisha Islands was also proposed. The Nine-Province long-distance telephone service is to be extended to Sian (Shensi) and Taiyuan (Shansi); telephone communication between Peiping and Hankow will be installed and the long-distance telephone service in Hunan expanded.—*Chinese Economic Bulletin.*

Egypt.—STATE BROADCASTING.—An alternative programme system, providing separate simultaneous transmissions for Arabic and European listeners, was to be inaugurated by the Egyptian State Broadcasting organisation on November 1st.

France.—RENNES.—The power of Radio Rennes was increased to 40 kW on October 15th, and will remain at that figure until the new 120 kW station under the Ferrié scheme is completed at Thourie.

EIFFEL TOWER RADIO.—The broadcasts from the Eiffel Tower are to cease. M. Mallarme, the Minister of Posts and Telegraphs, considers that the station interferes too much and fails to fulfil modern needs. According to *Reuter*, two new decrees regulating broadcasting in France have been passed to increase State control and provide for greater co-ordination.

WIRELESS LICENCE FIGURES.—At the end of August there were 1,625,444 paying receiving-set users.

Germany.—TELEVISION EXPERIMENTS.—The German postal authorities are reported to be carrying out television experiments between Berlin and the Brocken, a distance of about 120 miles. Transmission is being effected on a 7-metre wavelength, the receiving apparatus being mounted on a travelling test van.

Great Britain.—RADIO RELAYS.—The Birchington Parochial Committee has accepted the offer of Mr. Barrows, radio engineer, Birchington, for the installation of a relay service.

India.—TELEPHONE EXTENSIONS.—According to Mr. P. S. Pursell, chief engineer, posts and telegraphs, the telephone service between Madras and Calcutta will open early next year, which will obviate the necessity of Madras speaking to Calcutta through Bombay. The service will be provided along the east coast. Other extensions planned are from Bellary to Dharwar and Hubli, and from Madura to Tinnevelly and Tuticorin. As regards radio telephone between Madras and Rangoon, apparatus has already been ordered.

Japan.—PACIFIC TELEPHONE.—A wireless telephone service between Tokio and Batavia (Java) was opened on October 25th. A similar service between New York, San Francisco and Tokio will be opened on December 1st, says *Reuter* (Tokio).

WIRELESS TELEPHONE EXTENSION.—The international wireless telephone service which is already in operation with Manchukuo and Manilla has been extended to Java.—*Reuter* (Tokio).

Madagascar.—TELEPHONIC COMMUNICATION.—Telephonic communication has recently been established in Madagascar, between Antananarivo and Diego-Suarez, and between the last-named town and Tamatave.

Portugal.—NEW AUTOMATIC EXCHANGE.—President Carmona opened the new automatic telephone exchange of the Anglo-Portuguese Telephone Co. recently. The change-over was effected in 68 secs., and the first call was made by the President to the Prime Minister, Dr. de Oliveira Salazar. The new Strowger equipment of 8,000 lines cost £100,000, and was built by the Automatic Electric Co.

Russia.—NEW RADIO STATIONS.—According to an *Exchange* message from Moscow, the Council of the People's Commissars has given permission for the construction of a network of 149 radio stations.

Wales.—BROADCASTING.—The B.B.C. has announced that, owing to certain difficulties, it is unlikely that the new Bangor studio will be opened before the end of 1935.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Aberdeen.—November 7th. Various works, including electrical and water heating at new church and hall at Hilton. Specifications from, and tenders to, G. Bennett Mitchell & Son, architects, 1, West Craibstone Street, Bon-Accord Square.

Aldershot.—November 10th. Electricity Department. Meters. (See this issue.)

Argentina.—BUENOS AIRES.—Ministry of Public Works. November 30th. Hydro-electric plant. (A.Y. 12704.)*

Australia.—MELBOURNE.—State Electricity Commission of Victoria. December 10th. Oil-insulated transformers. (A.Y. 12719.)* 6,600-V compound-filled circuit-breaker unit and accessories. (A.Y. 12700.)*

Posts and Telegraphs Department. December 18th. Automatic telephone switching equipment. (A.Y. 12663.)*

Telephone switchboard lamps, lamp-caps and sockets. (A.Y. 12731.)*

December 11th. Telephone switchboard keys of various types and accessories. (A.Y. 12712.)* Resistance and reactance spools and coils. (A.Y. 12709.)*

Motor-generators and rectifiers of various types. (A.Y. 12733.)*

SYDNEY.—December 3rd. New South Wales Public Works Department. Hydro-electric plant in connection with the Burrinjuck water power development scheme. (A.Y. 12617.)*

Municipal Council. December 17th. 33,000-V and 11,000-V switchgear. (A.Y. 12703.)*

January 7th. Automatic boiler control equipment for three boilers at the Bunnerong power station. (A.Y. 12737.)*

BRISBANE.—January 25th. City Council. One 18,750-kW steam driven turbo-alternator, together with cooling equipment, piping, &c. (A.Y. 12741.)*

Barking.—November 12th. Electricity Department. L.p. cable. (See this issue.)

Blackpool.—November 20th. Corporation. Eight 300-kVA, fifteen 150-kVA and three 400-kVA transformers. (See this issue.)

Brighton.—November 6th. Corporation. Complete electrical installation at the Municipal Airport. (October 12th.)

Cumnock (AYRSHIRE).—Town Council. Various works, including electrical, at 164 houses. Specifications from R. D. Hunter, town clerk.

Darton.—November 3rd. Lighting installation at new senior school. Particulars from education officer, County Hall, Wakefield.

Ealing.—November 20th. Electricity Department. 11,000-V and 660-V metal-clad switchgear, and 660-V distribution fuse boards. (See this issue.)

Egypt.—KHARTOUM.—December 13th. Public Works. Ministry in the Sudan. Electrical wiring materials for workshops at Gordon's Tree Dockyard. (A.Y. 12706.)*

Grimsby.—November 9th. Electricity Department. L.p. cables. (October 26th.)

Hastings.—November 29th. Electricity Department. Materials for the year commencing January 1st, 1935. (October 26th.)

India.—NEW DELHI.—November 26th. Stores Department. Flameproof v.i.r. cable. (A.Y. 12717.)*

Kilkenny.—November 17th. Commissioner of the District Mental Hospital. Electrical installation and subsidiary services at the hospital. Specifications from J. P. Tierney & Co., 44, Kildare Street, Dublin (deposit £5 5s.); tenders to P. J. Cassin, resident medical superintendent, District Mental Hospital.

Lanark.—November 5th. County Council. Various works, including electric lighting, at new Police station, Carluke, and new schoolhouse, Forth. Particulars from J. Stewart, county architect, 20, Albert Street, Motherwell.

Lincoln.—November 7th. Electricity Department. Three 6,600/400/230-V, 3-phase, oil-immersed transformers. (October 26th.)

Manchester.—November 19th. Electricity Committee. Water-cooling towers for Stuart Street power station. (See this issue.)

Moffat.—November 10th. Town Council. Various works, including electrical, at housing scheme. Schedules from, and tenders to, town clerk.

New Zealand.—WELLINGTON.—Posts and Telegraphs Department. December 5th. 200 lead-acid secondary cells. (A.Y. 12687.)*

CHRISTCHURCH.—Electricity Department. January 15th. Metal-clad switchgear. (A.Y. 12723.)*

Northampton.—November 10th. Transport Committee. 365 to 400-V, 3-phase, 50-cycle motors. (October 26th.)

Oldham.—November 17th. Electricity Committee. L.p. cable. (See this issue.)

Peebles.—November 20th. County Council. Various works, including electrical alterations and additions to Kingsland House. Schedules from Dick Peddie & Walker Todd, architects, 8, Albyn Place, Edinburgh (deposit £1); tenders to joint county clerks.

South Africa.—PORT ELIZABETH.—November 22nd. Municipality. Steam turbo-generator. (A.Y. 12678.)*

CAPE TOWN.—November 21st. Electricity Department. P.i., impregnated lead-sheathed, steel tape armoured cables. (A.Y. 12701.)*

November 28th. 300 street-lighting fittings. (G.Y. 14418.)*

PRETORIA.—November 23rd. Union Tender and Supplies Board. Linesmen's detectors. (A.Y. 12721.)*

JOHANNESBURG.—November 23rd. Railways and Harbours Administration. Motor-driven plate-splitting and punching machine with bar angle and tee bevel cropper. (A.Y. 12714.)*

GEORGE.—November 29th. Municipality. Equipment in connection with proposed change-over from d.c. to a.c. (A.Y. 12725.)*

Southend-on-Sea.—December 6th. Electricity Department. Two alternators and switchgear. (See this issue.)

Stoke-on-Trent.—November 14th. Electricity Department. Electric cookers. (See this issue.)

Swansea.—November 8th. Electricity Department. One 10,000-kW turbo-alternator and accessories. (October 12th.)

Uruguay.—MONTEVIDEO.—November 26th. Supply and Telephones Administration. Metal filament lamps. (A.Y. 12670.)*

Walsall.—November 13th. Electricity Department. Electrical material, &c., for one year from January 1st, 1935. (October 26th.)

Watford.—November 5th. Electricity Department. Water-cooling tower. (October 19th.)

Wimbledon.—November 12th. Electricity Department. One 100-kW and alternatively one 200-kW direct-coupled, single-phase, 50-cycle, 2,000-V Diesel-generator. Specifications from chief engineer and manager, Corporation Electricity Works, Durnsford Road.

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Allendale.—Parish Council. Accepted. Poles, overhead transmission lines and street lighting at Allendale & Catton.—F. Reid Ferens & Co.

Barking.—Electricity Committee. Recommended. V.i.r. cable (renewal of contract for further twelve months).—Union Cable Co., Ltd.

Bethesda.—U.D.C. Recommended. Extending electric lighting and power mains to Llanllechid and Ciltwllan (£361).—W. T. Henley's Telegraph Works Co., Ltd.

Enfield.—Housing Committee. Accepted. Wiring Council houses (£5 to £7 per house).—Jenkins & Sons.

Falkirk.—Public Health Committee. Accepted. Electric lighting work at new clinic (£136).—A. A. Mayes.

Keighley.—Electricity Committee. Accepted. Steam jet air pump (£163).—W. H. Allen, Sons & Co., Ltd.

Highways Committee. Accepted. Traffic signals (£787).—Automatic Electric Co., Ltd.

London.—POPLAR.—Works Committee. Recommended. Electric hoist (£124.)—E. P. Allam & Co.

L.C.C.—Housing and Public Health Committee. Accepted. Wiring and fittings for electric lighting: Briscoe Buildings, Lambeth (£628).—G. Goodchild. Caledonian estate (£1,774) and Wedmore estate, Islington (£1,486).—A. Meckhonik. Chadworth Buildings, Finsbury (£741), Haggerston Road, Shoreditch (£564), and Northwold Road, Hackney (£538).—Hall & Stinson. Ossulston estate, St. Pancras (£888).—City Electrical Co.

Morecambe.—Electricity Committee. Armoured cable (£112).—W. T. Glover & Co., Ltd.

Newcastle.—City Council. Accepted. Electric lighting of Kenton Lodge Training College extensions (£132).—Simm & Richardson.

Redhill.—Middlesex C.C. Accepted. Internal telephone system at institution (£195).—Siemens-Schuckert (Gt. Britain), Ltd.

Salford.—Electricity Committee. Recommended. Transformers for twelve months.—Electric Construction Co., Ltd.

Scarborough.—Electricity Committee. Recommended. Cable for duplicate supply to Filey (£2,782).—British Insulated Cables, Ltd. Electricity kiosk at Cayton Bay (£685).—Metropolitan-Vickers Electrical Co., Ltd. Cable covers (£385).—H. J. Baldwin & Co.

Shipley.—Electricity Committee. Accepted. Cable (£420).—Standard Telephones & Cables, Ltd.

Southampton.—Corporation. Accepted. 25,000-kW turbo-alternator complete with condensing plant.—C. A. Parsons & Co., Ltd.

Stoke-on-Trent.—Electricity Committee. Accepted. Electric vehicle battery (£166).—Tudor Accumulator Co., Ltd.

Wolverhampton.—Electricity Committee. Accepted. Reactors (£700).—General Electric Co., Ltd.

Makers' Names Wanted

Readers are requested to enclose a stamped addressed envelope with their inquiries.

POLYCHROME fittings.
JIFFY vacuum cleaner.
ACE ironclad switchgear.
STELL high-voltage type fault-finding set.
GINETTE motors.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 8th. Institution, London. 6 p.m. "Hydro-Electric Development in Great Britain." Messrs. A. S. Valentine and E. M. Bergstrom. (*Meter and Instrument Section*).—Friday, November 2nd. Institution, London. 7 p.m. Address by Prof. J. T. MacGregor-Morris. (*North-Eastern Students' Section*).—Friday, November 2nd. Armstrong College, Newcastle-on-Tyne. 7.15 p.m. "Public Lighting by Electricity." Mr. J. A. Prowse. Saturday, November 10th. Visit to the Gosforth electric car shed, Newcastle. (*Mersey and North Wales (Liverpool) Centre*).—Monday, November 5th. University, Liverpool. 7 p.m. "Research in the British Post Office." Capt. B. S. Cohen. (*North Midland Centre*).—Tuesday, November 6th. Queen's Hotel, Leeds. 7 p.m. "Application of a Gas-Cooled Arc to Current Conversion." Mr. W. G. Thompson. (*North-Western Centre*).—Tuesday, November 6th. Engineers' Club, Manchester. 7.15 p.m. "Organisation of Electricity Supply in New Zealand." Mr. F. T. M. Kissel. (*Wireless Section*).—Wednesday, November 7th. Institution, London. 6 p.m. Address by Mr. S. R. Mullard. (*Dundee Sub-Centre*).—Thursday, November 8th. University College, Dundee. 7.30 p.m. "Anti-Friction Bearings." Mr. A. Pollock. (*North-Western Students' Section*).—Thursday, November 8th. Engineers' Club, Manchester. 7.15 p.m. Joint meeting with the Institution of Mechanical Engineers. (*North-Western Graduate Section*).—"Sales Organisation." Mr. R. L. Willott. (*North Midland Students' Section*).—Saturday, November 10th. Visit to the Fryston Pit of the Airedale Collieries, Ltd.

Physical Society.—Friday, November 2nd. Imperial College of Science and Technology, S.W.7. 5 p.m. Six short papers.

Association of Mining Electrical Engineers (*West Wales Branch*).—Saturday, November 3rd. Y.M.C.A., Swansea. "Civil Engineering at Tir John Power Station." Mr. H. V. Phillips.

Electrical Power Engineers' Association (*London Local Group*).—Monday, November 5th. "Electricity Supply Economics." Mr. J. V. Brittain.

Association of Mining Electrical Engineers.—Tuesday, November 6th. Junior Institution of Engineers, S.W.1. 6.30 p.m. Presidential address by Mr. F. C. Knowles. (*Kent Sub-branch*).—Saturday, November 3rd. Technical Institute, Dover. 6.30 p.m. "A Description of Athens Power Station." Mr. W. T. Cox.

Batti-Wallahs' Society.—Tuesday, November 6th. Hotel Metropole, W.C.2. 12.30 for 12.55 p.m. Luncheon. Address by Sir R. Burton Chadwick.

Institution of Engineers & Shipbuilders in Scotland.—Tuesday, November 6th. Institution, Glasgow. 7.30 p.m. "Cinematograph Apparatus, With Special Reference to Sound Projection." Mr. D. W. Hamilton.

Edinburgh Electrical Society.—Wednesday, November 7th. Philosophical Institution, Edinburgh. "Electricity as Applied to Fuel Oil Burning Equipment." Mr. A. B. S. Laidlaw.

Rugby Engineering Society.—Wednesday, November 7th. Rugby. "Photo-Elasticity Applied to Engineering." Prof. E. G. Coker.

Bristol Electric Club.—Friday, November 9th. Royal Hotel, Bristol. 8.15 p.m. Address by Mr. F. Little.

Notes

Extensions at Bridport

A new 430-kW English Electric Diesel alternator was formally started up at Bridport power station on October 25th by Mrs. E. S. Reynolds, wife of the chairman of the Electricity Committee, and switched in by the Mayoress, Mrs. S. J. Gale. The engine is of the five-cylinder totally enclosed type and is rated at 625 b.h.p. at 375 r.p.m. An individual fuel pump serves each cylinder and provision is made for equalising the load distribution. Compressed air at 250 to 300 lb. per sq. in. is used for starting, and the set can be put on load in two minutes. The direct-coupled three-phase alternator has an output of 538 kVA at 6.6 kV, 50 cycles. Before connecting up the set the station voltage was altered from 3.3 to 6.6 kV for supplying the rural area. The extension into the outlying country will add 100 consumers immediately to the 1,240 already connected in the town, of which 1,000 are residential. The undertaking runs a showroom and wiring department, and the apparatus on hire includes over 300 cookers. The plant extension is the second that has been made since the inception of the undertaking nearly five years ago.

The area of supply is about 44,000 acres with a population of under 15,000 and about forty miles of h.v. and l.v. distributors have made electricity available to about 12,000 people. The total capital expenditure is over £60,000, and the undertaking has been self-supporting from the outset. All the extensions have been planned by Mr. H. F. Castle, the borough electrical engineer, who was unfortunately absent from the opening ceremony owing to ill-health.

An E.P.E.A. Dinner

Electrical developments in Central England were referred to by Mr. S. T. Allen, the Central England Engineer for the Central Electricity Board, when proposing the toast of "Electrical Power Engineers" at the annual dinner of the North-West Midlands Section of the E.P.E.A. at the Victoria Hotel, Wolverhampton, on October 26th. He said that the maximum demand on the Central England grid in October was 565,000 kW, and he estimated that in December it would reach 695,000 kW, while the kWh sold during the year would be about 240,000,000. The results were due in no small measure to co-operation between the Board's officials and the various supply undertakings. He believed that many more men should be engaged on the development side. It was a sound investment to spend money on development officers. Mr. R. H. Toynbee (president, E.P.E.A.), responding, agreed that it would be to the good of the industry if the number of development officers were trebled or quadrupled, but it was important that they should be men who knew their jobs thoroughly. He had hopes that the present negotiations on the salaries schedule would come to a fairly successful issue. Mr. D. J. Duffy, chairman, toasted the ladies in a witty speech, and also responded. He congratulated Mr. W. E. Fry, the honorary secretary, on his efficient organisation of the event. A dance followed later in the evening.

E.A.W. Activities

A very good meeting of the members of the Electrical Association for Women attached to headquarters was held last Friday to discuss the formation of a London branch of the Association. Mrs. G. Z. de Ferranti, the chairman, and the director (Miss Haslett), pointed out that a separate branch would give the members more scope for their activities, more members would have a chance of holding office, and facilities for spreading a knowledge of the Association through a wider area of London would be increased. The meeting unanimously decided in favour of the new branch. The committee, which will start operations on January 1st, will consist of Mrs. Atkinson, Miss G. Sharp, Mrs. Bentham, Mrs. Hawkins, Mrs. Dover, Mrs. Ritchie, Mrs. Jackson, Mrs. Leevers, Mrs. Hinchliff, Mrs. Mills, and Mrs. Troughton. Mrs. Bentham was elected chairman of the new branch, and Mrs. Dover, B.Sc., honorary treasurer; the office will be at 20, Regent Street, S.W.1.

The number of branches of the E.A.W. is increasing rapidly. New branches have been formed or will be formed during the current month at Stafford, Huddersfield, Skipton, Seaham Harbour, Bedford and Warrington, bringing the total up to forty-seven branches and four units.

Electrical Engineers' Ball

The Electrical Engineers' Ball for 1935 will be held at Grosvenor House, Park Lane, W., on Friday, February 8th, 1935, the day after the annual dinner of the Institution of Electrical Engineers. The details will be settled by the Executive Committee which is making much improved arrangements for the comfort of guests, both as regards dancing and supper. Tickets will be one guinea each and will be obtainable as usual from members of the General Committee. Any surplus remaining after defraying the cost of the Ball will be handed over to the I.E.E. Benevolent Fund.

The Tyne Electrical Engineers

Past and present officers of the Tyne Electrical Engineers R.E. held their fifteenth annual re-union dinner at the headquarters, Tynemouth, on October 27th, when Major R. P. Winter, M.C., the commanding officer, presided. He was supported by the honorary colonel, Colonel Ernest Robinson, C.B.E., T.D., Colonel A. B. Ogle, O.B.E., Chief Engineer, Air Defence Formations, and Colonel J. N. Cash, M.C., C.R.E. Northumbrian Area. Following the Loyal Toast, Major O. M. Short, O.B.E., T.D., proposed "The Tyne Electrical Engineers, R.E.," and during the course of his remarks mentioned that the history of the unit, covering the first fifty years of its existence, would be published shortly. Major Winter replied to the toast. The health of the visitors was proposed by Col. Robinson and responded to by Col. Ogle. The toast of the "Reserve and Retired Officers" was proposed by Capt. B. H. Leeson and replied to by Lieut.-Col. E. H. E. Woodward, M.C., T.D.

A Diesel-electric Paddle Steamer

The good results obtained from the Diesel-electric screw steamers of the Loch class, which have been built during the last few years for service on the West Coast of Scotland and are operated by Messrs. David Macbrayne & Co., Ltd., have encouraged the L.N.E. Railway Company to go a step farther. The company has just placed an order with Messrs. A. and J. Inglis, Ltd., Glasgow, for a Diesel-electric paddle ship for its services from Craigendoran on the Firth of Clyde. Messrs. Denny, Dumbarton, built two Diesel-electric paddle ferry-boats for service on the Forth this year, but the L.N.E.R. boat will be the first paddle ship in this country to be propelled by direct drive Diesel-electric machinery. The engines will be directly coupled to d.c. generators which will supply power to a directly connected motor on the paddle shaft. All the electric power equipment will be supplied by the English Electric Co., Ltd. One of the advantages of this type of driving machinery is the fact that for a given area there can be provided a larger space under shelter on the main deck and more room in the lower saloon forward. In the new boat first-class passengers will be accommodated forward and the third class aft, and the accommodation provided will show a considerable improvement over that on the existing steamers. Her length will be 215 ft., with a beam of 27½ ft. The specified speed is 17 knots.

Appointments Vacant

Rentals and cost clerk for Cheltenham electricity undertaking.

Mains assistant for Epsom & Ewell U.D.C. Electricity Department.

Consumers' engineer for Carlisle Electricity Department.

Testing engineer for Wolverhampton Corporation.

Junior switchboard attendant for Hove Electricity Department.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. F. H. Francis, deputy electrical engineer and manager to the Oxford Corporation, reaches the age of sixty-five in April, 1936, and the Electricity Committee has recommended that his services be retained until that date, his salary to be £650 per annum.

Mrs. I. M. Bolton has been appointed as one of the six representatives of the L.C.C. on the London and Home Counties Joint Electricity Authority. Mrs. Bolton is the first woman to be appointed by the L.C.C. on the J.E.A.

Lord Ashfield, chairman of the North Metropolitan Electric Power Supply Co., presented thirty testimonials on October 25th, at Northmet House, to employés of the company who have completed over twenty years' service. Mr. V. Needham, a sub-station attendant at the Wood Green sub-station, who had himself received a testimonial, replied on behalf of all the recipients. It has been the practice of the company for a considerable number of years to recognise long service by the presentation of an illuminated framed testimonial, which is accompanied by a gold watch in the case of the senior staff and a wallet containing the sum of £20 in the case of others. Two directors of the company, Sir James Devonshire, the deputy chairman, and Mr. C. G. Tegetmeier, have received testimonials, and thirty-three members of the administrative and technical staff, including the chief engineer, Mr. J. M. Donaldson, the secretary, Mr. E. Boys, and the deputy chief engineer, Mr. H. S. Selves. In addition, fifteen members of the clerical staff and seventy-two members of the operative staff, making a total of 122, have completed twenty years' service with the company and have received testimonials.

Mr. A. Haselhurst, chief clerk of the Willesden Corporation Electricity Department, has been appointed commercial assistant, and **Mr. F. D. Balshaw,** A.M.I.E.E., mains engineer, has been appointed chief technical assistant.

Lord Selsdon, chairman of the Special Committee set up to inquire into the development of television and to advise the Postmaster-General on the relative merits of the various systems, left England on October 24th, on the *Majestic*, for New York with **Col. A. S. Angwin,** assistant engineer-in-chief to the G.P.O., **Mr. Noel Ashbridge,** chief engineer to the B.B.C., and **Mr. F. W. Phillips,** assistant secretary to the G.P.O., members of the Committee, to carry out a short investigation of television methods in the United States. They

Members of the G.P.O. Television Committee at Waterloo en route for the United States

Left to right: Col. A. S. Angwin, Lord Selsdon, Mr. F. W. Phillips and Mr. Noel Ashbridge.

are expected back in this country towards the end of the current month. Other members of the Committee were expected to visit Germany this week for the same purpose.

It is reported that the prosecution concluded its case against **Mr. Samuel Insull** at Chicago a few days ago.

Mr. H. W. G. Mitchell, senior assistant engineer with the North-Eastern Electric Supply Co., Ltd., has been appointed shift charge engineer with the Galloway Water Power Co. Mr. Mitchell was apprenticed to the Bournemouth & Poole Electric Supply Co., with whom he became sub-station attendant. Subsequently he joined the Newport (Mon) electricity undertaking as junior assistant engineer, leaving there to join the North-Eastern Electric Supply Co.

Mr. G. K. Paton, M.I.E.E., engineer and manager of the North Wales Power Co., Ltd., and Electricity Distribution of North Wales & District, Ltd., has been appointed a director of the North Wales Power Co., with which he has been connected since it commenced operating under the North Wales Power Act in August, 1906. He has in no small measure been responsible for the development of the undertaking which now operates in the North Wales & South Cheshire Electricity District over an area of 4,000 sq. miles. He is a native of Dumbarton, receiving his early education at Dumbarton Academy and later at Heriot Watt College, Edinburgh. He joined Messrs. Bruce Peebles & Co., Ltd., in 1898 at their Tay Works, Leith, and later at East Pilton, Edinburgh, where after considerable experience in the various works departments he had charge of the test department. Following a period on contract work he was responsible for the testing and setting to work of the original North Wales Power hydro-electric scheme in North Wales in 1906. He joined the North Wales Power & Traction Co., Ltd., at the end of 1907 as chief electrical engineer, and in 1918 also held the appointment of electrical engineer to the Aluminium Corporation, Ltd., at Dolgarrog. Since 1923 considerable developments have been carried out in North Wales under the North Wales & South Cheshire Electricity District Order, 1923, and in conjunction with Sir Douglas Fox & Partners, the consulting engineers, Mr. Paton was responsible for the carrying out of the technical scheme approved by the Electricity Commissioners, including the new hydro-electric station at Maentwrog, which has now an installed capacity of 24,000 kW. Mr. Paton is a members of the Consultative Committee of the Central Electricity Board for North-West England & North Wales, and is one of the representatives of the North Wales Power Co. on the North Wales & South Cheshire J.E.A. He is also an associate member of the A.I.E.E.

Mr. G. K. Paton

Mr. T. Davies, chief assistant with the Plymouth Corporation Electricity Department, has been appointed chief technical assistant to the Stepney Borough Council Electricity Department to fill the vacancy caused by the recent appointment of Mr. A. E. Campbell as borough electrical engineer and manager. Mr. Davies was apprenticed to Messrs. Cory Bros. & Co., Ltd., Cardiff, with whom he held the successive appointments of power station superintendent, Resolven; engineer-in-charge of the electrical plant at Resolven; power station superintendent of the central power station; and chief assistant electrical engineer. He joined the Plymouth electricity undertaking in August, 1931, as station superintendent at Prince Rock power station, and during his eighteen months in this position large structural alterations and extensions were carried out. He was appointed chief assistant to the borough electrical engineer in February, 1933, and was acting engineer for a period of three months. His salary at Stepney will be £800 per annum, rising by annual increments of £50 to a maximum of £1,000 per annum.

Obituary

Mr. W. F. M. Mylan.—The death occurred on October 29th of Mr. William F. M. Mylan, M.I.E.E., of Sheffield, following a long illness, at the age of fifty-two. Mr. Mylan received his engineering training at the old Sheffield Technical School, and afterwards received a staff appointment as a lecturer, which he relinquished to join the British Westinghouse Co., Manchester, being later transferred to the Sheffield staff. For about nine years previous to 1919 he was the company's district manager. Mr. Mylan later entered into partnership as Messrs. Mylan & Smith, of Sheffield, but for the last four years he was in business on his own account. He was the Sheffield representative of the Metropolitan Cable & Construction Co.

Mr. L. H. Hurburgh, a junior partner of Messrs. W. F. Dennis & Co., wire manufacturers, of Queen Victoria Street, E.C., was found dead in his office on Tuesday last.

Dr. C. S. Schmid.—A *Reuter* message reports the death on October 30th, at the age of sixty-nine of Dr. Carl Sulzer Schmid, a director of Sulzer Bros.

Mr. F. J. Sprague.—We regret to record the death, at the age of seventy-seven years, of Mr. Frank Julian Sprague, who was one of the leading authorities on the subject of electric elevators, a pioneer in electric railway traction (the invention of the multiple-unit system stands to his credit),

and, indeed, for some thirty or forty years an eminent American electrical engineer of international reputation. In the 'nineties of last century THE ELECTRICAL REVIEW contained many reports and articles relating to his work, and even before that he was a familiar personality in electrical engineering circles in London by reason of the fact that in 1882 he was on duty at the Crystal Palace Electrical Exhibition on behalf of the United States Government. About eight years earlier (1874) he entered the U.S. Navy, and in 1880 carried out electrical work at the Brooklyn Navy Yard. After the Crystal Palace Exhibition he reported to the Navy Department upon the new electric light and power applications there demonstrated. An important move forward in his career dates from the time when he resigned from the Navy and entered the employ of Mr. Thomas A. Edison, under whom he applied himself to the development of electric motors, and at the Philadelphia Electrical Exhibition of 1884 the Sprague motors were exhibited for the first time. The Sprague Electric Railway & Motor Co. was organised in 1884. He then turned his attention to electric traction, and, with the support of Mr. E. H. Johnson, made a historic success at Richmond, Virginia, in 1888. The electric street railway dates from that time. He set to work upon the difficulties of elevated railway traction about the same period, giving demonstrations in New York and building large electric locomotives for experimental work. He achieved remarkable success with electric express elevators. In 1895 he invented the multiple-unit system, which was applied on the South Side Elevated in Chicago in 1897-98, and adopted for London underground lines. The Sprague Electric Co. was formed in 1897, and was later absorbed by the American General Electric Co. (1902). He was appointed in 1903 to the Commission for the electrification of the Grand Central Terminal. Among the awards which he received were the Edison Medal of the American Institute of Electrical Engineers and the Franklin Medal of the Franklin Institute. He was a past-president of the A.I.E.E., of which he was made an honorary member in 1932.

Mr. Frank J. Sprague

Mr. E. W. Backus, who was interested in a variety of Canadian enterprises concerned with lumbering, papermaking and power development, died recently in New York at the age of seventy-four.

In the Courts

AN action by the Franco-British Electrical Co., Ltd., against Yelin was in the list for hearing before Mr. Justice Horridge in the King's Bench Division on October 26th.

When the case was called on Counsel for the plaintiff company said that his Lordship on a previous occasion had ordered judgment to be given for the company on its claim subject to the defendant's counterclaim for damages for alleged breach of contract by the plaintiffs. Notice had now been given to the plaintiffs that defendant did not propose to proceed with the counterclaim, and in these circumstances it was asked that his Lordship should give judgment for the plaintiffs both on the claim and the counterclaim with costs.

His Lordship assented and made an order accordingly.

Damages for Slander

Ionlite, Ltd., Scrubs Lane, Willesden, makers of electric signs, claimed damages for slander against Fred Taylor, of Sandheys Avenue, Waterloo, at the Liverpool Assizes last week.

It was stated that Ionlite, Ltd., guaranteed that its material and work were British throughout and of the best quality. Taylor, however, was alleged to have said to one of the company's customers: "Ionlite, Ltd., have used foreign material in their installation at Nottingham. The cable and the convertor are both of foreign manufacture." As a result Ionlite, Ltd., lost the work of the firm concerned.

The company was awarded £20 special and £100 general damages.

A Tapped Relay Service

For "unlawfully abstracting electricity" belonging to Mr. Bernard Meggitt, Albert Road, Mansfield, proprietor of the Mansfield Relay Rediffusion Co., Mrs. Doris Hemingway, 25, Second Avenue, Clipstone, was fined 10s. at Mansfield recently.

Neon Installations, Ltd.

On October 29th Mr. Justice Eve again had before him in the Companies Court the petition by judgment creditors for the compulsory winding-up of Neon Installations, Ltd., the petition having been ordered to stand over on a previous occasion when it was before his Lordship to enable a meeting of the creditors of the company to be held in the meantime.

As there appeared to be a confliction of opinion between Counsel appearing for the judgment creditors and Counsel for the company as to what the outcome of the meeting was his Lordship said he did not propose to hear the petition in bits and directed that it should stand over for another week.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

W. Willis & Co., Ltd.—Private company. Registered October 26th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical and mechanical engineers carried on by Wm. Willis and Harold W. Burgess as "W. Willis & Co.," at 461A, Caledonian Road, N.7. The subscribers are: W. Willis, 41, Tytherton Road, Holloway, N., and J. W. Dalton, 17, The Crescent, Belmont, Sutton, Surrey. Solicitors: Garton & Co., 21, Maddox Street, W.1.

Thorpe, Surrage & Co., Ltd.—Private company. Registered October 26th. Capital, £2,000 in £1 shares. Objects: To acquire the businesses of electrical engineers and general electrical installation contractors carried on by T. A. Thorpe at 14, Endwell Road, Bexhill-on-Sea, and by Wm. P. Surrage at Pevensey, Sussex. The permanent directors are: T. A. Thorpe, 21, Eversley Road, Bexhill-on-Sea, and W. P. Surrage, Railway Hotel, Westham, Pevensey.

Kingsbury Engineering Co., Ltd.—Private company. Registered October 26th. Capital, £1,500 in £1 shares. Objects: To carry on business as mechanical and electrical engineers, manufacturers of machinery, tool makers, metal workers, &c. The subscribers are: S. Jarrett and G. H. Davis, both of 17, Shaftesbury Avenue, W. Solicitors: Stanley Jarrett & Co., 17, Shaftesbury Avenue, W.1.

G. C. Challinor & Co., Ltd.—Private company. Registered October 27th. Capital, £500 in £1 shares. Objects: To carry on business as electricians, radio engineers, electrical engineers, experts and contractors, armature winders, manufacturers of and dealers in electrical, gas and oil lamps, quartz lamps, reflectors, &c. The first directors are: G. C. Challinor, 20, Second Avenue, Fairfield, Bury, and E. Thomason, 8, Stanley Street, Bury.

D. Walter & Co., Ltd.—Private company. Registered October 24th. Capital, £1,200 in £1 shares. Objects: To carry on the business of electrical engineers, manufacturers of and dealers in all kinds of lighting equipment and accessories, etc. The directors are: J. D. Walter and Mrs. Vera K. N. Walter, both of Parkstone, Croydon Road, Beddington, Surrey. Registered office: 61/3, Lant Street, Southwark, S.E.1.

Beckenham Signs, Ltd.—Private company. Registered October 25th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a sign writer and manufacturer and store proprietor carried on by V. W. Cunis, at 103/9, High Street, Beckenham, and to carry on the business of neon sign manufacturers and erectors, advertising contractors and agents, &c. The subscribers are: V. W. Cunis, and Mrs. Ada F. Cunis, both of 40, Hampden Avenue, Beckenham, Kent. Victor W. Cunis is the first director. Secretary: G. J. Rose, 37, Mark Lane, E.C.

Morecroft, Ltd.—Private company. Registered October 13th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a battery charging and service station, electrical and radio service, carried on by T. D. Morecroft as "Morecroft Electric & Radio Service" at The Oaks Hotel Buildings, Barlow Moor Road, West Didsbury, Lancs. The directors are: T. D. Morecroft, 11, Manor Drive, West Didsbury, Manchester, and two others. Registered office: The Oaks Hotel Buildings, Barlow Moor Road, West Didsbury.

Returns of Electrical Companies

Associated Distributors, Ltd.—Capital, £80,000 in 50,000 10 per cent. cumulative preference and 30,000 ordinary shares of £1 each. Return dated June 20th, 1934. 43,400 preference and 30,000 ordinary shares taken up. £57,565 8s. paid (£1 per share on 43,400 preference and 13,332 ordinary and 1s. per share on 16,668 ordinary shares). Mortgages and charges, £35,477.

Frinton-on-Sea and District Electric Light and Power Co., Ltd.—Capital, £50,000 in 7,300 preference and 42,700 ordinary

shares of £1. Return dated June 28th, 1934. All shares taken up. £50,000 paid. Mortgages and charges, nil.

"M.K." Electric, Ltd.—Capital, £2,000 in £1 shares. Return dated July 21st, 1934. All shares taken up. £768 paid. £1,232 considered as paid. Mortgages and charges, £6,600.

W. Skewes & Co., Ltd.—Mortgage dated October 4th, 1934, to secure £800, charged on 12, South Parade, Doncaster. Holders: Woolwich Equitable Building Society.

Metropolitan Electric Tramways, Ltd. (in liquidation).—Satisfaction in full on April 24th, 1934, of trust deed dated January 21st, 1909, and deed supplemental thereto dated March 16th, 1910, and registered January 21st, 1909, and March 17th, 1910, respectively, securing £300,000 debenture stock. (Notice filed October 19th, 1934.)

Musselburgh and District Electric Light and Traction Co., Ltd.—Satisfaction to the extent of £1,500 on October 12th, 1934, of debentures authorised by resolutions of November 13th, 1905, and April 8th, 1909, and registered May 12th, 1909, securing £90,000 5 per cent. debentures.

Heath & Serena, Ltd.—The nominal capital has been increased by the addition of £4,000 in £1 ordinary shares beyond the registered capital of £2,000.

Dubilier Condenser Co. (1925), Ltd.—Capital, £500,000 in 500,000 10 per cent. non-cumulative preference shares of 10s. and 5,000,000 ordinary shares of 1s. each. Return dated June 12th, 1934. 200,000 preference and 1,026,250 ordinary shares taken up. £151,312 10s. paid. Mortgages and charges, nil.

Automatic Electrical & Mechanical Controls, Ltd.—The nominal capital has been increased by the addition of £19,500 beyond the registered capital of £500. The additional capital is divided into 195,000 ordinary shares of 2s.

Concordia Electric Safety Lamp Co., Ltd.—Issue on October 1st, 1934, of £300 debentures, part of a series already registered.

Electric Art Shades (1928), Ltd.—Mortgage dated October 16th, 1934, to secure £450, charged on freehold land, office, warehouse and buildings in Feering, Essex. Holders: W. T. Dyer, Grauntcourts, Rayne, Essex, and others.

Truvoice, Ltd.—Debenture dated October 15th, 1934, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: Ben Davis, 45, Maida Vale, W.9.

Borth & Ynyslas Electric Supply Co., Ltd.—Particulars filed on October 20th, 1934, of £2,500 debentures authorised July 7th, 1934, charged on the company's undertaking and property, present and future, including uncalled capital. The whole amount was issued on October 13th, 1934.

Seaton & District Electric Light Co., Ltd.—The nominal capital has been increased by the addition of £20,000 in £1 ordinary shares beyond the registered capital of £10,000.

Erie Resistor, Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £5,000.

Britannia Electric Lamp Works (1934), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated October 22nd, 1934, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

F. Malby & Co., Ltd.—C. F. Bland, 11, Sir Isaac's Walk, Colchester, ceased to act as receiver on October 10th, 1934.

Musselburgh & District Electric Light & Traction Co., Ltd.—Capital, £120,000 in £1 shares (60,000 ordinary and 60,000 preference). Return dated July 18th, 1934 (filed October 16th, 1934). 51,007 ordinary and 50,400 preference shares taken up. £7 paid. £101,400 considered as paid. Mortgages and charges: £78,400 14s. 10d.

Atlas Electric & General Trust, Ltd.—Capital, £6,500,000 in 3,000,000 preference, 3,000,000 ordinary, and 500,000 unclassified shares of £1. Return dated July 26th, 1934. All the preference and ordinary shares taken up. £1,749,078 paid on 1,214,189 preference and 534,889 ordinary shares. £4,250,922 considered as paid on 1,785,811 preference and 2,465,111 ordinary shares. Mortgages and charges: £750,000.

Electroflo Meters Co., Ltd.—Capital, £21,000 in £10 shares. Return dated August 25th, 1934. 2,090 shares taken up. £10,900 paid and £10,000 considered as paid. Mortgages and charges: None registered.

Maxlume Lighting & Heating Co., Ltd.—Capital, £40,000 in £1 shares. Return dated August 30th, 1934. 32,288 shares taken up. £15,788 paid, £16,500 considered as paid. Mortgages and charges nil.

Southern Relay Service, Ltd.—Capital, £3,000 in 2,500 preference and 500 ordinary shares of £1. Return dated August 23rd, 1934. 465 preference and 340 ordinary shares taken up. £805 paid. Mortgages and charges nil.

City Notes

The Perak River Hydro-Electric Power Co., Ltd., held its annual meeting on October 25th, when Mr. G. Balfour (chairman), who presided, said that they had made marked progress during the last financial year, as shown by increased output and net revenue. Considerable progress was also made during the year in connecting new business which, together with the improved demand from old customers, should be reflected in another substantial increase in the current year's account. The trade upon which the Malay Peninsula depended was at a level which was likely to be maintained, but they must not forget that in the nature of the Malayan industries an electricity supply authority was likely to suffer wider fluctuations than in countries with a more diversified industrial load. During the last three financial years they had witnessed the rapid drop in tin consumption from uncontrolled or, say, 100 per cent. output in Malaya to a mining quota of 23 per cent. The effect of the restriction scheme was to gradually reduce stocks of tin to more normal proportions and increase the price from £100 to about £230 per ton. These ups and downs in Malaya had a close relation to any scheme of reorganisation of their capital, and the directors had come to the conclusion that the time had now arrived to consider the reorganisation of the financial structure of the company; a scheme would be submitted during the current financial year. Regarding the prospect for this year they could look forward to a substantial increase, although it might not be so great as last year. Whatever profits were made, however, they had so much to write off that they could only look forward to paying the same charges as during the past year until they had carried out a capital reorganisation.

Erinoid, Ltd.—Presiding at the annual meeting held on October 25th, Mr. A. Binnie (chairman) said that there had been a further large increase in sales during the year under review. The total had exceeded that of the preceding year by 37 per cent. in weight and 41 per cent. in value, and was more than double the total for 1931. The profits for the second half of the past year were adversely affected by a very steep rise in the cost of raw material due in the first place to the prolonged drought, pointing to a scarcity of supplies, and also to the increase in the value of the franc. In view of the increased sales and the need to maintain their stocks and provide for further plant and machinery it was proposed to issue at an early date 6 per cent. £1 redeemable preference shares to ordinary shareholders in the proportion of one preference share for every twenty ordinary shares held. The amount would be £55,000.

The Norwich Electric Tramways Co. reports a balance from revenue account for the year ended June 30th last of £26,281, which with interest (£1,480) and transfer fees (£6), makes £27,767. After providing for depreciation of motor omnibuses, &c., the net profit is £19,249, against £17,429 in the preceding year. The final dividend is 1 per cent., making 3½ per cent. for the year (against 5 per cent.), and £867 is carried forward. During the year the Eastern Counties Omnibus Co. acquired a controlling interest in the undertaking.

Callender's Share & Investment Trust, Ltd., reports a revenue of £40,993 for the year ended August 31st last as against £40,132 in the preceding year. After deducting debenture stock interest, &c., and adding £74,735 brought in, there is a balance available of £112,459. The dividend is maintained at 20 per cent., less tax, and £50,525 is carried forward. Meeting: November 8th.

Drake & Gorham, Ltd., report a net loss for the year ended June 30th last of £4,692, as against £17,432 in the preceding year. From this is deducted £2,628 brought in, leaving a debit of £2,063 to be carried forward.

The Shropshire, Worcestershire & Staffordshire Electric Power Co. has declared interim dividends of 4 per cent. on the "A" ordinary and 2½ per cent. on the "B" ordinary shares (unchanged).

W. T. Henley's Telegraph Works Co., Ltd., have declared an interim dividend on the ordinary shares of 1s. 6d. per share, less tax.

Glenfield & Kennedy, Ltd., have declared an interim ordinary dividend of 3 per cent. (against 2 per cent.).

The City of Buenos Ayres Tramways Co. (1904), Ltd., has declared a quarterly dividend at the usual rate of 1¼ per cent.

Meters, Ltd., has announced an interim ordinary dividend of 2½ per cent. (unchanged).

Stocks and Shares

TUESDAY EVENING.

THE outstanding feature in the Stock Exchange markets is, without doubt, the strength shown by all the British Government securities, and by other stocks and shares which can claim a nodding acquaintance, so to speak, with the Safety First circle. New high price records have been established day after day. The value of money shrinks continually. Borrowers now find it a matter of no great difficulty to fill their requirements at a rate of interest seldom exceeding 3½ per cent., in all such cases as those where the security they have to offer is of good class. The Central Electricity 3½ per cent. scrip, offered the other day at 93, after a somewhat hesitating start, upon the opening of the market, forged ahead to 2½ premium, and has, in the present temper of the market, a good chance of going still higher. The other issues of the Board remain unchanged.

That Trustee List

Attention is being called to the matter raised here last week in regard to the opening of the trustee list to securities of which the Central Electricity Board's issues make good examples. The trustee is complaining that the area of his choice is too closely restricted, and that the stocks of the Public Boards offer sufficiently sound security to warrant these issues being included in the list of investments to trustees. The reluctance of the Government to permit the widening of the trustee stocks circle is perhaps not difficult to understand, but that this reluctance will be overcome it seems to be reasonable to expect.

The Municipal Elections

The immediate course of prices in the gilt-edged market may be affected, it is possible, by the result of the municipal elections to be held on Thursday in this week. But whatever the issue of these contests, the fact will remain that accumulation of capital, accompanied as it is by disturbed conditions in the speculative areas devoted to mining and similar shares, must almost inevitably force up the prices of Safety First stocks. London Passenger Transport "C" at 87 has put on 10s. By the loss of a similar fraction the combine's 5 per

cent. "B" stock has receded to 125, at which price the yield on the money is 4 per cent.

Electricity Supply Shares

Changes in the list of ordinary shares in electrical distribution companies are again few and insignificant. City Lights have risen 6d. to 36s. A thousand or two of the ordinary shares in the Charing Cross, the Chelsea and the South London Companies can be bought between 35s. 6d. and 36s., the average yield being £3 18s. 6d. per cent. on the basis of the 7 per cent. standard rate of dividend. Charing Cross might be found available at 35s. 3d. County of London ordinary are on offer at 56s. 9d., and Metropolitans at 54s., the shares at these prices yielding £3 14s. per cent. on the money. A thousand Electric Supply Corporation ordinary have come on offer at 59s., giving £3 14s. 6d. per cent. The useful line of 5,000 North Metropolitan Electric ordinary is offered at 65s. 6d., but the return is no more than £3 1s. per cent. on the dividend rate of 10 per cent. that has been paid during each of the past few years.

In the Provincial group, 1,000 Llanelly and District ordinary can be bought at 25s. to give 4 per cent. Newcastle and District Electric ordinary at 35s. 6d. pay £3 18s. 9d. per cent., the same income as can be obtained from 2,000 Lancashire Electric Light and Power ordinary on offer at 38s. West Gloucestershire ordinary is firm at 90½.

Colonial and Foreign

Amongst Colonial issues, Victoria Falls have reacted to 6½, and Tokyo sixes, in the foreign group, show a small gain at 85. Atlas have weakened to 6s. 9d. In some quarters the shares are regarded as a good speculative investment, though on the other hand there are people who regard them as being somewhat risky, in view of the large holdings that the Trust possesses in South Americans. British Power and Light shares keep a few pence above their par value of 20s. East Africans are very firm at 34s. 6d. Calcutta ordinary, after being 61s. 3d., eased off to 60s. 9d.

Cables and Wireless

The slight disappointment experienced with the Cables & Wireless earnings for September has found further reflection in a fall of 1½ in the combine's 5½ per cent. preference stock, lowering the price to 77, while the "A" ordinary at 16¾ is ¾ easier. These declines have not prevented Globe Telegraph & Trust ordinary from improving to 9⅛. The Anglo-American group keeps its improvements. Great Northern Telegraph shares remain dull at 36. There has been a little speculative buying of Marconi Marines on the hope of an increase in the last-paid 7½ per cent. dividend. The price, however, remains unchanged at 32s. 6d. Oriental Telephones at 3¼ are 2s. 6d. up. American Telephone & Telegraphs further receded 2 points, to 110½. International Telephones weakened to 10½ and Western Unions to 33½.

Manufacturing and Equipment

After the very substantial rises which have taken place recently in the ordinary shares of electrical manufacturing and equipment companies, it is not very surprising to find some signs of fatigue. Arons, which recently distinguished themselves by a violent advance to 72s. 6d., have gone back to 70s. British Insulated ordinary, a persistent demand for which on behalf of certain trust companies in the North raised the price to 76s. 6d., are a trifle down at 75s. Johnson & Phillips at 29s. 3d. and Siemens ordinary at 18s. 9d. show falls of 9d. and 1s. 3d. respectively. Henleys, upon which an interim dividend of 1s. 6d. has been declared, are a trifle down at 6⅞, and Callenders at 3¼. On the other hand, Enfield Cable ordinary hardened to 95s., and Enfield Rolling Mills, for which there has been a demand, keep good at 25s. 6d. Crompton Parkinsons spurted to 32s. 6d.; Ericsson Telephones rose to 84s. 6d. International Automatic Telephone ordinary fell back to 36s. 3d.; the deferred remaining at 36s., while of the lower-priced shares Telephone Manufacturing at 4s. 1¼d., and Telephone Rentals at 8s. 7½d., have scarcely moved since a week ago. In the spate of new issues which is one of the present day features in the financial world, the companies connected with electricity and telephony have been but modestly represented. It is said, however, that several new interesting offers are in contemplation for early issue.

Miscellaneous Matters

The United States controls to a large extent the market prices of certain commodities, of which rubber may be cited as one of the most important. President Roosevelt seems to be still unable to present a fixed policy that will command the support and revive the confidence of his fellow-countrymen, with the result that prices of stocks and shares either connected with or dependent upon the United States move in disappointing manner to holders. Rubber, the commodity, keeps about 6¾d. per lb.

The iron and steel market is one of the firmest in the Stock Exchange, thanks to the steady progress which week by week is reported from various branches of the industry, fortified by dividend declarations and excellent reports. Babcock & Wilcox are harder at 43s. 6d. Vickers have strengthened to 10s. 3d., and a number of other iron and steel shares have responded to the firmer tone of the market as a whole. British Electric Traction deferred stock, at 855, shows a rise of 10, making no less than 200 points advance in a couple of months.

Share List of Electrical Companies

	Nom.	Dividend. 1932.	Dividend. 1933.	Price. Oct. 30.	Rise or Fall.	Yield. p.c. £ s. d.
Home Electricity Companies.						
Bournemouth and Poole	1	15	15	78/9	—	3 16 2
Brompton Ordinary	1	7	7	34/6	—	4 1 2
Charing Cross Ordinary	1	7	7	35/-	—	4 0 0
Chelsea	1	7	7	34/6	—	4 1 2
City of London	1	7½	7½	36/6	+6d.	4 2 2
Clyde Valley	1	7	7	2	—	3 10 0
County of London	1	10½	10½	56/6	-6d.	3 14 4
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Elec. Dis. Yorkshire	1	9	9	49/6	+6d.	3 12 10
Elec. Supply Corporation	1	11	11	58/9	—	3 14 10
Kensington Ordinary	1	7	7	34/6	—	4 1 2
Lancs Light and Power	1	7	7½	37/6	—	4 0 0
London Electric	1	7	7	34/6	—	4 1 2
Metropolitan	1	10	10	53/6	—	3 15 6
Midland Counties	1	7	7	37/6	—	3 14 8
Mid. Elec. Power	1	8	8	45/-	—	3 11 1
North Eastern Electric Ordinary	1	6	6	33/6	—	3 11 8
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	55/-	—	3 12 9
Notting Hill 6% Pref.	10	6	6	14¼	—	4 4 4
North Met. Elec. Ordinary	1	10	10	3¼	—	3 1 6
Do. do. 6% Pref.	1	6	6	31/6	—	3 16 2
St. James' and Pall Mall	1	7	7½	36/6	—	4 2 2
Scottish Power	1	8	8	41/6	—	3 17 2
South London	1	7	7	35/6	—	3 19 0
Westminster Ordinary	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7¼% Pref.	1	7¼	7¼	22/-	—	6 16 4
Yorkshire Elec.	1	8	8	46/6	—	3 8 8
Public Boards.						
Central Electricity, 1950–70	Stock	5	5	115	—	4 7 0
Do. 1955–75	„	5	5	117	—	4 5 6
Do. 1951–73	„	4½	4½	110	—	4 1 10
Do. 1963–93	„	—	3½	101	—	3 9 4
London & Home Counties, 1955–75	„	4½	4½	112	—	4 0 4
London Passenger Transport, A...	„	—	4½	121½	—	3 14 0
Do. do. B...	„	—	5	125	-½	4 0 0
Do. do. C...	„	—	3	87	+½	3 9 0
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
Telegraph and Telephone.						
American Tel. & Tel.	$100	9	9	110½	-2	8 3 0
Anglo-Am. Tel. Pref.	Stock	6	6	114	—	5 5 2
Do. Def.	„	1½	1½	27¾	—	5 8 1
Cables & Wireless 5½% Pref.	„	2¾	2¾	77	-1¼	3 11 5
Do. A. 7½% Ord.	„	Nil	Nil	16¾	-¾	—
Do. B. Ord.	„	Nil	Nil	7½	—	—
Globe Tel. and T. Ord.	10	Nil	2½	9⅛	+⅛	2 12 0
Do. do. Pref.	10	6	6	12½	—	4 16 0
Great Northern Tel.	10	20	20	36	—	5 11 1
Marconi-Marine	1	10	7½	32/6	—	4 12 4
Oriental Telephone Ord.	1	12	12	3¼	+¼	*3 13 10
Home and Foreign Trams, Etc.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	855	+10	—
Do. do. Pref. Ord.	„	8	8	165½	—	4 16 10
Brazil Traction	100	—	—	11⅜	-⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	106	—	4 14 3
Mexico Trams, 5% Bonds	—	5	5	21½	+4	—
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	—	5	5	40	+2	—
Victoria Falls Ord.	1	15	20	6½	-⅛	3 1 7
Yorkshire (West Riding)	1	2½	5	25/-	—	4 0 0
Manufacturing Companies.						
Aron Electricity Ord.	1	10	10	70/-	-2/-	2 17 2
Assoc. Elec. Ord.	1	4	3	22/-	—	2 14 7
Do. Prf.	1	8	8	32/6	—	4 18 6
Babcock & Wilcox	1	9	6	43/0	+6d.	2 15 2
British Aluminium Ord.	1	5	5	20/6	—	3 7 9
British Insulated Ord.	1	15	15	75/-	+⅛	4 0 0
Brush Ord.	Stock	Nil	Nil	43	—	—
Callender's	1	15	15	3¼xd	-⅛	4 12 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/-	22½	12½	32/6	+½	1 18 6
Do. 8% Pref.	1	8	8	33/9	—	4 14 10
Edison-Swan 1st Pref.	1	7½	7½	22/6	—	6 13 4
Do. 5% Deb.	Stock	5	5	107½	—	4 13 0
Electric Construction	1	Nil	Nil	13/9	—	—
Enfield Cable Ord.	1	25	20	4½	-⅛	4 6 3
English Electric	1	Nil	Nil	5/9	—	—
Do. do. Pref.	1	Nil	Nil	10/9	—	—
Ever Ready	5/-	35	35	27/3	+3d.	6 8 5
Ferranti Pref.	1	7	7	28/-	-6d.	5 0 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	8	45/9	—	3 9 10
Henley's	1	30	30	6⅞	-⅛	4 11 5
Do. 4½% Pref.	5	4½	4½	5½	—	3 18 3
India-Rubber Preferred	1	—	—	1	—	—
Johnson & Phillips	1	5	5	29/3	-9d.	3 8 5
Siemens Ord.	1	6½	4	18/9	-⅛	4 5 4
Telegraph Construction	£1	Nil	Nil	1¼	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1932

36798. "Control systems for the motors of electrically driven vehicles employing regeneration for braking purposes." A. M. Willis. December 29th, 1932. (417502.)

1933

2968. "Carrier-frequency signalling systems." R. J. Halsey. January 31st, 1933. (417251.)

3121. "Inductance coils." General Electric Co., Ltd., H. C. Turner, G. R. Polgreen, C. G. Smith, and C. N. Smyth. February 1st, 1933. (Cognate application 9985/33.) (417378.)

3158. "Cathode elements for use in thermionic tubes, electric discharge tubes and the like." A. C. Cossor, Ltd., and T. A. Robins. February 2nd, 1933. (417446.)

6138. "Measurement and indication of high voltages." British Thomson-Houston Co., Ltd., and C. G. Mayo. (Allgemeine Elektricitäts-Ges. (in part)). February 28th, 1933. (417380.)

6288. "Drives for electric locomotives." British Thomson-Houston Co., Ltd. March 1st, 1932. (417448.)

6579. "Dynamo-electric generating apparatus." G. M. Pestarini. March 3rd, 1933. (417381.)

7095. "Sealing conductors into vitreous envelopes." General Electric Co., Ltd. March 8th, 1932. (417511.)

7844. "Glow-discharge tubes for photographic sound recording." Fidelity Films, Ltd., and C. P. Ryan. November 9th, 1933. (417450.)

8569. "Wireless signalling or distant-control systems." M. Compare. March 21st, 1933. (417256.)

9123. "Flashing apparatus for navigational and other lights." Chance Bros. & Co., Ltd., and T. H. Slim. March 27th, 1933. (417261.)

9557. "Radio-receiving apparatus." E. K. Cole, Ltd., and G. Bradfield. March 30th, 1933. (Cognate application 16632/33.) (417384.)

9623. "Protective devices for electric circuits." International General Electric Co., Inc. March 30th, 1932. (Addition to 399,042.) (417328.)

9625. "Electric ship-propulsion systems." British Thomson-Houston Co., Ltd., and G. O. Watson. March 30th, 1933. (417329.)

9790. "Electrical impedance networks." Telefonaktiebolaget L. M. Ericsson. April 1st, 1932. (417386.)

9800. "Photo-electric selecting system." K. Nakanishi and K. Nakanishi. April 12th, 1932. (417387.)

9892. "Automatic control of currents in electric circuits." S. A. Stevens, and Westinghouse Brake & Saxby Signal Co., Ltd. April 1st, 1933. (417460.)

9917. "Electric lighting and power plants." F. Carter, E. Carter, and Blackstone & Co., Ltd. April 3rd, 1933. (417390.)

9930. "Electric selective switching systems." Siemens Bros. & Co., Ltd., W. G. Patterson, and D. P. Long. April 3rd, 1933. (417461.)

9974. "Wireless receiving systems." A. L. M. Sowerby and A. C. Cossor, Ltd. April 3rd, 1933. (417515.)

9982. "Jacketed steel electrodes for electric arc welding." Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken. August 9th, 1932. (417516.)

10006. "Dynamo-electric direct-current generators." G. M. Pestarini. April 3rd, 1933. (417517.)

10080. "Holders for electric lamps." S. S. Schreiber. April 4th, 1933. (417393.)

10141. "Electrical indicating systems." W. G. Roche, E. L. Littleword, H. H. Ker, and C. Remington. April 5th, 1933. (417463.)

10213. "Electrical condensers." Telegraph Condenser Co., Ltd., and H. W. Cole. April 5th, 1933. (417395.)

10242. "Towers for use as or for carrying electrical conductors." Blaw-Knox Co. April 6th, 1932. (417467.)

10326. "Control switches for electric motors." International General Electric Co., Inc. April 6th, 1932. (417396.)

10327. "Liquid-break electric circuit-breakers." British Thomson-Houston Co., Ltd. April 6th, 1932. (417333.)

10432. "Automatic or semi-automatic telephone or like systems comprising coin-box stations." Standard Telephones & Cables, Ltd. September 28th, 1932. (417524.)

10552. "Fixed contact members of electrical connecting devices such as link-disconnecting boxes." British Insulated Cables, Ltd., and R. W. Blades. April 8th, 1933. (417397.)

10587. "Electromagnetic 'pick-up' devices." British Goldring Products, Ltd. November 28th, 1932. (417531.)

10750. "Means for the protection of electrical installations." W. Fennell. April 11th, 1933. (417338.)

11490. "Adjustable electric imitation-fuel fires." H. H. Berry and Berry's Electric (1928), Ltd. April 19th, 1933. (417270.)

13176. "Arrangements for measuring current in direct-current electric circuits." B. A. G. Churcher and Associated Electrical Industries, Ltd. May 5th, 1933. (417399.)

14288. "Means for regulating the continuous voltage furnished by rectifiers of the mercury-vapour type." Forges et Ateliers de Constructions Electriques de Jeumont. May 27th, 1932. (417402.)

16826. "Thermionic valve caps and valve holders." M-O Valve Co., Ltd., C. G. Eden, and G. J. Smithells. June 13th, 1933. (417476.)

16840. "Scanning devices for television and the like." W. J. Nobbs. June 13th, 1933. (417477.)

19190. "Gasfilled triode circuits." General Electric Co., Ltd., and L. I. Farren. July 10th, 1933. (417408.)

21756. "Filters for super-heterodyne circuits for wireless reception." British Acoustic Films, Ltd., and W. H. Harrison. August 3, 1933. (417410.)

24035. "Electric propulsion of ships." Akt.-Ges. Brown, Boveri et Cie. August 30th, 1932. (417412.)

28057. "Electric tumbler switches." A. P. Lundberg & Sons, Ltd., and G. Pegg. October 11th, 1933. (417483.)

28586. "Electric lampholders." A. P. Turnbull and P. G. Archer. November 3rd, 1932. (417484.)

28885. "Electrodeposition of cadmium." E. S. Andres (American Smelting and Refining Co.). October 18th, 1933. (417419.)

29327. "Television and like picture transmitting systems." Marconi's Wireless Telegraph Co., Ltd. November 1st, 1932. (417282.)

29716. "Electrical clocks." M. Mome. October 26th, 1933. (417485.)

31631. "Radio receivers." Marconi's Wireless Telegraph Co., Ltd. November 14th, 1932. (417284.)

32343. "Cathode-ray oscillographs." British Thomson-Houston Co., Ltd. November 18th, 1932. (417420.)

33590. "Electrodes for sparking plugs." B. G. Soc. La Bougie. December 2nd, 1932. (417287.)

34078. "Finger dial for impulse transmitters." M. B. Richter. December 4th, 1933. (417289.)

31523. "Inertia-operated electric safety devices for protecting motor cars against fire after collision." D. Slebos. December 16th, 1932. (417422.)

1934

454. "Electric lamps or the like." British Thomson-Houston Co., Ltd. January 5th, 1933. (417553.)

1227. "Indicating devices on radio receivers and the like." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. January 24th, 1933. (417293.)

2786. "Aerial systems suitable for use for wireless broadcasting." Telefunken Ges. für Drahtlose Telegraphie. January 26th, 1933. (417296.)

3131. "Electric heating apparatus." British Thomson-Houston Co., Ltd. February 1st, 1933. (417427.)

3157. "Signalling systems particularly suitable for hospitals, hotels and the like." E. Saelen. January 30th, 1934. (417297.)

3216. "Earth clips for electrical conductors and wireless uses." G. Scott, J. Griffiths and H. Freestone. January 31st, 1934. (417298.)

3940. "Thermionic valves and like discharge devices." Telefunken Ges. für Drahtlose Telegraphie. February 6th, 1933. (417498.)

5987. "Control systems for a plurality of parallel-connected asynchronous electric motors." Siemens-Schuckertwerke Akt.-Ges. May 6th, 1933. (417303.)

7301. "Portable electric battery lamps." R. Dight. March 7th, 1934. (417430.)

10332. "Electrical welding machines." D. Sciaky. April 6th, 1933. (417367.)

10930. "Electromagnetic devices." Siemens and Halske Akt.-Ges. April 11th, 1933. (417311.)

11628. "Devices for generating electromagnetic fields oscillating with quasi-optical frequencies." J. Y. Johnson (Ternion Akt.-Ges.). December 28th, 1932. (Divided application on 417501.) (417564.)

12426. "Contacts for electrical switchgear." Schiele & Bruchsaler Industriewerke Akt.-Ges., and J. A. Crabtree and Co., Ltd. April 27th, 1933. (417567.)

13015. "Cathode-ray tube oscillographs." Marconi's Wireless Telegraph Co., Ltd. April 29th, 1933. (417435.)

13896. "Methods of capping electric incandescent lamps or the like." General Electric Co., Ltd. June 2nd, 1933. (417436.)

13901. "Electric switches, more particularly for radio receivers." Lissen, Ltd., and J. W. Clark. May 8th, 1934. (417437.)

16280. "Thermionic amplifiers." Naamlooze Venootschap Philips' Gloeilampenfabrieken. June 20th, 1933. (Addition to 388292.) (417440.)

18019. "Electric discharge tubes." Naamlooze Venootschap Philips' Gloeilampenfabrieken. August 28th, 1933. (Addition to 392796.) (417441.)

18880. "Pupin coil boxes." Siemens & Halske Akt.-Ges. June 26th, 1933. (417580.)

19118. "Navigation lamps for aircraft." H. C. Peirce and A. M. Desoutter. December 23rd, 1932. (Divided application on 36534/32.) (417319.)

22841. "Electric switch-fuses." English Electric Co., Ltd., A. M. Pooley and A. A. Heath. February 10th, 1934. (Divided application on 4482/34.) (417442.)

24137. "Inductance coils." General Electric Co., Ltd., H. C. Turner, G. R. Polgreen, C. G. Smith and C. N. Smyth. February 1st, 1933. (Divided application on 417378.) (417376.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from October 24th:—

WG (lettering and design). No. 548592. Class 8. Electric batteries (not for medical purposes), coils, sparking plug testers, &c.—William Gill, 31, Pershore Street, Birmingham.

RAP. No. 551625. Class 9. Radio reception and transmission apparatus.—R. A. P., Ltd., 13, Creek Road, East Molesey, Surrey.

Electreliance, John Walsh (lettering and design). No. 553612. Class 13. Electric lighting, heating and power fittings, electric lamps (ordinary), contacts and terminals, cut-outs, and switches (ordinary).—John Walsh, 2, King Street, Blackburn.

Plasmic. No. 554113. Class 50. Synthetic resin sold in form for industrial purposes.—Plasmic, Ltd., 54, Aldermanbury, E.C.2.

I.E.E. Transmission Section Conversazione

The newly formed I.E.E. Transmission Section has arranged to hold a conversazione, supper-dance, and exhibition of overhead line equipment at Harrod's Georgian Restaurant, Knightsbridge, on November 23rd, commencing at 8 p.m. Tickets, 12s. 6d. per person, including supper but not wines or buffet refreshments, are obtainable from the secretary of the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham.—Church for the Rev. G. D. Brook and members of the Timperley Methodist Church; F. Chippendale, architect. "Kurna," Moss Lane, Timperley.

Aylesbury.—Houses (46); R.D.C. surveyor.

Barking.—Block for maternity hospital; H. H. Dawson and H. W. Allardyce, architects, Clock House Chambers. Town hall, with arcade of shops; borough engineer.

Barnsley.—Houses (57); D. Hammerton, builder, Doncaster Road.

Bath.—Houses (128), Shophouse Road; city surveyor. Extensions to baths (electrical work) (£8,000); A. J. Taylor, architect.

Bedfordshire.—School, Northfield Housing Estate, Dunstable (£13,554), for County E.C.; O. P. Milne, architect, London, W.1.

Berkshire.—Senior school, Didcot, for County E.C.; director of education, Reading.

Birmingnam.—Business premises, Bull Street (£20,000), with electrical work; Percy Cox, Ltd., builders, Grove Road, Handsworth. Church, for the Rev. Father G. Watts, Church of St. George, Station Road, Dorridge; J. Arnold Crush, architect, York Road, Edgbaston. Cinema, Coventry Road, Small Heath (£30,000); Wilfred Robbins, Ltd., Great Bridge, Staffs. Cinema, King's Road, Kingstanding (£30,000); Housing Ltd., builders, Station Road, Blackheath. Extension to Cameo Cinema, Maxstoke Lane, Coleshill, for J. Wynne & Co., W. S. Bowles, builder, "Dorill," 6, Rose Road, Coleshill. Factory, Lombard Street and Cheapside (£25,000), with electrical work, and extensions to works, Coleshill Road, Sutton Coldfield, for James Southerton & Son, 14-24, Sandy Lane; W. J. Whittall & Son, Ltd., builders, 131, Lancaster Street.

Bognor Regis.—Public library, Belmont Street; U.D.C. surveyor.

Bradford.—Bus station, Chester Street, for West Yorkshire Road Car Co., Ltd., Harrogate; A. P. Harrison, architect, High Close, High Lane, Keighley.

Bromley.—School and clinic, Bromley Common (£16,600), for Borough E.C.; Horace Newby, Ltd., builders, Lee, S.E.

Cardiff.—Houses (24), Penhill Estate; Penhill Estates, Ltd. Houses (100), Sloper Road, &c.; city engineer.

Carlisle.—Houses (80), Currock House Estate (£24,592); Housing Committee.

Carnforth.—Church, Dolphinholme, for Methodist Union Building Committee; T. E. Bee, architect, Wham's Lane, Bay Horse Street, Lancaster.

Croydon.—Factory, Progress Way; Croydon Factory Estate, Ltd. Sewage works (£210,000); borough engineer.

Cumnock.—Houses (166), electrical work; R. D. Hunter, town clerk.

Devizes.—Extensions to hospital (£18,520); W. E. Chivers & Sons, Ltd., builders.

Dover.—Cinema, London Road; F. E. Bromige, architect, Regent Street, London, W.1.

Durham.—School, Billingham (£12,880), for C.C.; F. Willey, architect, 34, Old Elvet. School, Easington, for E.C. (£17,303); C. Valkes, builder, Bedale, Yorkshire.

Edinburgh.—Church, Granton; J. F. Mathew, of Lorimer & Mathew, architects. Factory and office buildings for Thompson & Norris Manufacturing Co., Ltd. (£20,000), Turnhouse Road; J. R. McKay, architect, 4, Melville Street.

Elgin.—Houses (70), Kingsmills and Bishopmill; A. A. Turriff, burgh surveyor, Town House.

Elstree.—New film studios for the London Film Productions, Ltd. (£300,000).

Enfield.—Houses (20), Connaught Avenue; W. Goodchild & Co. Houses (32), Lincoln Way; F. R. St. John.

Essex.—Schools, Chingford (£13,489), and Rochford (£20,903), for County E.C.; J. Stuart, county architect, Chelmsford.

Ewell.—Extensions, Mental Institution (£49,863); Henry Boot & Sons, Ltd.

Flintshire.—Alterations to Holywell County School and Mold County School; R. G. Whitley, county architect, County Buildings, Mold.

Glasgow.—Extensions, Royal Asylum for Blind (£24,000); West Scotland Joint Committee. Extensions, St. Mungo's Secondary School and Queen's Park School; Education Director.

Godalming.—Cinema, Ockford Road, for the County Cinemas, Ltd., London, W.1.

Grays.—Extensions to Little Thurrock Hospital, for Orsett Joint Hospital Board; C. M. Ansell, clerk, 11, Chadwell Road.

Grimsby.—Houses (100); W. Pinkney, builder, Huddersfield.

Guildford.—Underground car park, Tuns Gate site; borough engineer.

Hamilton.—Houses (900), Burnbank; Alex Cullen, architect.

Hartlepool.—Houses (300); T. Miers, borough engineer.

Hull.—Secondary school for City E.C.; director of education.

Inverness.—Houses (140), Telford Street; burgh surveyor.

Irish Free State.—(MOONCOIN, Co. KILKENNY).—Technical school for the County Vocational E.C.; R. Breathnach, principal.

Irlam (LANCS).—Houses (54), Gerrard's Farm site, for J. B. Bushell.

Jarrow-on-Tyne.—Houses (160, direct labour; J. S. Weir, borough engineer.

Kent.—School for boys, Gravesend, for County E.C.; director of education, Maidstone.

Kidderminster.—Houses (20), Wolverhampton Road, for Lloyd Bros.

Leicestershire.—Boys' School, Wigston (18¼-acre site) for County E.C.

Lincoln.—Houses (50), Simon's Hill; city surveyor.

Liverpool.—Houses (72), High Street, Wavertree; Director of Housing.

London.—(ACTON).—Factory, Victoria Road, for Pritchard & Burton, 1, Farringdon Road, E.C.1. (CAMBERWELL).—Extensions, Maudesley Hospital (£29,283); W. H. Gaze & Sons, Ltd., Kingston-on-Thames. Rebuilding, Credon Road Council School (£36,449); L.C.C. E.C. (CATFORD).—Houses (31), Flower House Estate; L.C.C. Town Planning Committee. (CLAPHAM).—Flats (£137,150), for L.C.C.; Wilson Lovatt & Sons, Ltd., builders, Wolverhampton. (ELTHAM).—Houses (102), Eltham Park Estate; L.C.C. Town Planning Committee. (FINCHLEY).—Library, Ravensdale Avenue; borough engineer. Extensions to 31, High Street; Priors, Ltd. (FULHAM).—Twenty-seven dwellings, Breer Street (£17,919); borough engineer. Rebuilding West Kensington Central Schools (£40,000); L.C.C. E.C. (GREENWICH).—Houses (36), Normanhurst Park Estate; L.C.C. Town Planning Committee. Rehousing, Eastney Street (£60,000); L.C.C. architect. (KENSINGTON).—Reconstruction of Central School (£30,000); L.C.C. architect. (LAMBETH).—Tenements, Tyers Street (£82,000); L.C.C. architect. (LEE).—Houses (61), Woodstock Estate; L.C.C. Town Planning Committee. (POPLAR).—Factory, Gale Street; Allied Supplies, Ltd. (ST. PANCRAS) School, Euston Road; Rev. Canon John Dunford, St. Patrick's R.C. Church, Soho, W.1. (SOUTHGATE).—Houses (196), Oak Lodge Estate; Geo. Reed & Sons. Twenty-eight shops and flats, Heddon Court Estate, Cockfosters; F. W. Walter. Cinema, Old Southgate, for the Odeon Co. (TOOTING).—Laundry to Tooting Bec Hospital (£12,385); F. & T. Thorne. (TOTTENHAM).—Modernisation of North Eastern Hospital (£209,443); L.C.C. architect. (WHITECHAPEL).—Two blocks of dwellings, Old Castle Street (£30,000); L.C.C. Housing and Public Health Committee. (WOOD GREEN).—Alterations and extensions, Town Hall; C. H. James, architect.

Luton.—Houses (24); C. C. Smith, builder. Secondary school (£60,000), for Borough E.C.; director of education. Swimming bath, New Bedford Road; borough surveyor.

Manchester.—Cinema, at junction of Nuthurst Road and Broadway, Moston; F. Fenn, architect. Shops and houses, Rochdale Road, Blackley, for S. Haling, 12, Moreton Street, Cheetham; Teasdale & Sunter, architects, 4, St. Mary's Parsonage. Elementary school for Rev. Father T. J. O'Shaughnessy, P.P. St. Luke's, Swinton Park Road, Pendleton; Hill, Sandy & Norris, architects, 9, Albert Square.

Middlesex.—Buildings to Mental Colony, Shenley (£16,000); county architect. Schools, Hayes, Ruislip, Wealdstone, for County E.C. Extensions to North Middlesex Hospital (£17,546); L. & W. Whitehead, Ltd.

Moffat.—Houses, Rogermoor; Reid & Forbes, architects, 17, Great Stuart Street, Edinburgh.

Morecambe.—Houses (92), and shops, Great Wood Estate; J. H. Atkinson. Garage, Heysham Road (£16,230); borough engineer.

Newcastle-on-Tyne.—Factory and offices, Elswick Road, for the North of England School Furnishing Co., Ltd.

Northenden.—Factory, Sharston Road, for W. J. Brookes & Sons, Ltd. (£21,000).

Northumberland.—School, Gosforth (£33,800); W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Oldbury.—Junior school, Bleak House (£8,600), for E.C.; D. Johnson, builder, Birmingham.

Orrell (LANCS).—Houses (38), Spring Road, for Mrs. Heaton.

Oxford.—Cinema, Gloucester Green (£75,000), for the Union Theatres (Oxford), Ltd.

Portsmouth.—School, Cosham (400 places), and instruction centre, King Street (£9,547), for Borough E.C.; director of education.

Reading.—Houses (288), Elms Estate, Henley Road; Industrial Builders, Ltd. Houses (68), White House site, Basingstoke Road; housing architect.

Royston (YORKS).—Houses (26), Cross Lane; Dyson, Cawthorne & Coles, architects, 25, Regent Street, Barnsley.

Rugby.—Houses (168), Hillmorton Road; T. Bird, 34, North Street.

Seisdon.—Houses (31); R.D.C. surveyor.

Sevenoaks.—Houses (56); building surveyor, Inglewood, Oak Hill Road.

Slough.—Four factories; Slough Estates, Ltd.

Smethwick.—Extensions to factory, Cranford Street; Guest, Keen & Nettlefolds, Ltd. Factory extensions, Gt. Arthur Street; Wilson Bros., Ltd.

South Shields.—School, Cleadon, and additional houses; J. Reid, borough engineer.

Stocksfield-on-Tyne.—Telephone exchange; R. Gazzani & Sons, builders.

Stoke-on-Trent.—Houses (180), Goldenhill Estate; city engineer.

Sunderland.—Houses (30), for tubercular families; T. P. Callinge, borough engineer.

Surrey.—School, Stoneleigh, Ewell (£19,750), for County E.C.; secretary, Kingston-on-Thames.

Swadlincote.—Houses (52), for S. Whittaker.

Tewkesbury.—Hospital (£8,000); T. Overbury, architect; F. W. Godfrey, builder.

Twickenham.—Kneller School for E.C.

Wallasey.—Central School for boys and girls for Corporation E.C.; Willink & Dod, architects, Cunard Buildings, Pier Head, Liverpool.

Walsingham.—Houses (40), Fakenham; Housing Committee.

Welwyn Garden City.—Houses (78); U.D.C. surveyor.

West Lothian.—County Council Offices (£60,000); County clerk, Linlithgow.

West Sussex.—Extensions, including assembly hall, two laboratories, &c., Horsham High School for Girls, for County E.C.; C. G. Stillman, county architect, North Street, Chichester.

Wolverhampton.—Houses (22), Bee Road, Fordhouses; W. H. S. Morris. Houses (20), Marsh Lane; B. & E. Estates. Houses (34), Powell Street; H. Grindley. Cinema, High Street, Wednesfield (£20,000); Satchwell & Roberts, architects, 6, New Street, Birmingham.